

PRACTITIONER'S HANDBOOK
OF
DISEASES OF THE EAR
AND
NASO-PHARYNX

(THIRD EDITION OF THE "AURAL SURGERY")

BY

H. MACNAUGHTON JONES, M.D., M.Ch., M.A.O. (Hon.)

FELLOW OF THE ROYAL COLLEGES OF SURGEONS OF IRELAND AND EDINBURGH
EXAMINER IN OBSTETRICS AND DISEASES OF INFANT LIFE IN THE ROYAL UNIVERSITY
LATE UNIVERSITY PROFESSOR IN THE QUEEN'S UNIVERSITY



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To the Memory of the late
JAMES HINTON,

AURAL SURGEON TO GUY'S HOSPITAL,

AS A SLIGHT RECOGNITION OF MANY ACTS OF KINDNESS RECEIVED
FROM HIM

BY THE AUTHOR,

THIS WORK IS INSCRIBED.



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P R E F A C E.

IN introducing this work to the Profession, I desire in the first place to say that it is practically a new book, being entirely rewritten and rearranged. This was absolutely necessary, not alone from the unavoidably hurried compilation of the previous edition, but on account of the rapid advances made during the last few years in the science of otology. I cannot, however, place this edition before the Profession without acknowledging the too generous reception accorded to the last, and also to my *Atlas of Diseases of the Tympanum*, both in this country, in America, and on the Continent. It being well understood that this book is not so much a systematic treatise as a practical Handbook of Diagnosis and Treatment for the use of Practitioners, I am not, as I have already plainly stated in previous editions, under the necessity of devoting space to the anatomy and physiology of the organs of hearing, though I have added a short chapter, drawing attention to some of the most important points in the anatomy of the ear, bearing on aural therapeutics. A much more complete description than I could hope to give in a work of this size will be found by any student and practitioner in his standard text-books of anatomy and physiology, while, far better than plates, he will find a few careful dissections of the ear and naso-pharynx, and a careful study of the prepared sections of the petrous portion of the temporal bone—(1) the section showing the meatus, membrana tympani, ossicles, and middle ear; (2) that showing the cavity of the tympanum and its openings, the internal ear with its semi-circular canals, the cochlea, and the various orifices. (These temporal bones may be obtained from Messrs Matthews, of Carey Street, London, and will be found extremely useful aids in the study of the anatomy of the ear.) The beautiful models now to be had of any instrument maker will materially assist such study. The anatomical plates of Professor Adam Politzer are the best I know of, and have been generally used by me in giving clinical instruction. Those who are deficient in such practical acquaintance with the natural relations of the parts, should make good their deficiency in some other way than by plates and text-books before they attempt the treatment

of middle and internal ear affections. This refers to the naso-pharynx as much as to the ear proper.

To the aurist the naso-pharynx is part of the aural apparatus. This necessitates accurate knowledge of the anatomy of the nasal fossa and pharynx, a knowledge to be gained only by an examination of the parts in the wet state. The success of the previous editions of this work has encouraged me to prepare this present more compact form. The many valuable larger treatises on the ear are, of course, replete with information on the subject of otology. It has been my experience that these larger works are not carefully or widely read by busy practitioners, and rarely by students.

Hence, through the medium of these pages some concise rules for practice, and useful hints on treatment, may be acceptable both to the practitioner and student. In order to do this I shall endeavour to make these observations as simple as possible, and deal principally with those diseases of every-day occurrence, for the treatment of which all practitioners are being constantly consulted. It will not be necessary for this purpose to enter into vexed questions as yet unsettled, but simply to point out the leading principles which should guide the surgeon in arriving at a quick and safe diagnosis in any aural case. Nor is it necessary to distract attention by repeated reference to authorities.

To those in general practice, who may still regard the ear as an organ which is the special property of aurists, I would simply say here, that the practitioner who intelligently sets himself to discover the cause of any aural affection or deafness, and rationally applies his remedies for its cure, need not hand the ear over as the "special" property of any self-constituted authority, but may, in the great majority of ear cases which meet him in daily practice, deal with it himself. This much is certain, that by this more largely diffused and ready knowledge the public would gain infinitely more than is the case at present from the concentration of even a higher degree of skill in the hands of a comparatively few. The prevention of disease and deafness, rather than the frequently futile effort to cure conditions which might have been prevented, would be the obvious result.

The neglect of the study of aural pathology and therapeutics in the schools I refer to elsewhere in the work.¹

The empiricism which suggests "a drop of glycerine to be put into the ear-passage night and morning," "the use of a counter-irritant behind the ear," the resort to useless and dangerous "syringing," has little excuse, if in the false notion that in aural therapeutics "if ignorance is bliss it is folly to be wise," the hearing of an ear is permanently lost. Yet these I have often known to be the remedies recommended for serious aural affections, by some who would be rightly indignant if they were not looked on as enlightened

¹ See Chapter I.

and educated physicians. It is thus that many cases of incurable ear affections seek relief in the extern department of a hospital, and in the study of the aurist, that should never find their way to either place. The greater the interest one takes in the therapeutics of aural affections himself, the more he must desire to see a wider spread of rational therapeutical knowledge in the treatment of the ear.¹ This wish grows with his every-day experience of the results of ignorance of this knowledge, and the want of cultivation of that experience which may be gained in almost any large general practice, and the study of some simple treatise on the subject.

I studiously avoid touching on dubious remedies of which I have not much personal knowledge of the effects, and that are not safe in the hands of the practitioner; nor do I embrace a reference in detail to certain operative procedures, some of which are of very doubtful efficacy, and all of which are attended, especially if undertaken by inexperienced hands, with a certain degree of risk.

The practitioner who desires fuller information on disputed points of pathology and differential diagnosis will find it in the exhaustive treatise of Politzer, translated by the late distinguished Glasgow aurist, Dr J. Patterson-Cassells, and in the works of Burnett, St John Roosa, Turnbull, Gruber, and others.

By the deaths, during comparatively recent years, of Hinton and Cassells, the United Kingdom has lost its most distinguished aurists. It was more especially through the disinterested kindness of Mr Hinton that, as far back as the year 1868, I was first brought to take an interest in Aural Surgery, and to feel, in his own words, "that very few fields of practice afford subjects of greater interest to study, or give a larger reward to the exercise of skill." In his unique *Atlas of Morbid Conditions of the Tympanum*, he has bequeathed a legacy of labour and artistic skill to otology which is not likely to be rivalled.

In writing the second edition of this work, I was assisted by Drs Löwenberg of Paris, Weber-Liel of Berlin, and Turnbull of Philadelphia, and I received valuable aid from several distinguished English authorities.

The brief observations on post-nasal catarrh and affections of the tonsils, contained in the portion of the work devoted to naso-pharynx, are, with some necessary alterations and additions, mainly those made by Dr Morell Mackenzie in the second edition. For the remarks on othæmatoma, and the drawings of the auricle illustrating this disease, I am still indebted to Dr Ringrose Atkins.

I have in this edition interpolated the series of notes (1885-86) on

¹ Only this day I was interested to learn from himself the successful efforts of Dr J. Swift Walker of Hanley, Staffordshire, to transplant the egg membrane to close a perforation of the membrana tympani in four patients. The antiseptic solution used to assist transplantation was a solution of 1 to 500 of perchloride of mercury in distilled water and 2 drops of glycerine to the ounce.

aural therapeutics which appeared recently in the pages of the *Practitioner*. While omitting matters not of practical importance to the general surgeon, I have added considerably in other directions in which I consider additions have been made to our knowledge during the last few years.

A special feature of the present book is the addition of coloured plates taken from my *Aural Atlas*, which represent some of the more commonly occurring morbid states of the tympanum.

I am under special obligation to Messrs Baillière, Tindall, and Cox for the use of some engravings of Professor Adam Politzer, as also to Drs Barr (Glasgow) and Cresswell Baber (Brighton) for the same.

The instrument makers, Messrs Mayer & Meltzer, Krohne & Sesemann, Maw, Son & Thompson, and Matthews, can supply the various appliances mentioned in the text.

Since the body of this work has passed through the press, I am reminded of an inadvertent omission of mine in the previous edition, in the chapter on Adenoid Growths of the Naso-Pharynx, and which, unfortunately, I have not corrected. In a letter from Sir Andrew Clark (December 11, 1881) he justly reminds me that he "described them many years ago in the first volume of the *London Hospital Reports*." This was in the year 1864, in his article on "Naso-Palatine Gland Disease." With some slight differences in the pathological appearances, due probably to secondary complications, the description is accurate of the adenoid vegetations of Meyer and Löwenberg. Considering the important bearing these growths have on hearing and speech, it is right to accord to the original investigator the credit due to his important observation.

ERRATA.

Page 46, col. 1, line 15 from foot, for "figs. 23 and 24" read "figs. 30 and 31."
Page 48, fig. 31, for "Lamp for Oil" read "Lamp for Gas."

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DISEASES OF THE EAR.

CHAPTER I.

INTRODUCTORY.

NEGLECT OF THE STUDY OF OTOLOGY—EXCUSE FOR EMPIRICISM—DIAGNOSIS OF DISEASES OF THE EAR—RELATIVE FACILITY OF AS COMPARED WITH THE DIAGNOSIS OF AFFECTIONS OF OTHER ORGANS—NECESSITY FOR DEXTERITY OF MANIPULATION IN AURAL THERAPEUTICS—SOME GENERAL OBSERVATIONS ON.

MANY years since Sir William Wilde drew attention to the general vagueness which exists amongst medical men on the subject of aural disease. Yet at the present day how many medical men do we find who view interference with any aural complication, save the simple blocking-up of the meatus with cerumen, as “meddlesome” and dangerous? How constantly do we hear physicians, well informed on other matters, speak of any interference with the ear as “poking” and “meddling”! The cause of this is not far to seek. To the same source of ignorance is attributable the want of knowledge of ophthalmic and laryngeal affections. The teaching of all the three organs—eye, ear, and throat—is too much neglected in the schools generally: an accurate knowledge of their diseases and pathology is not sufficiently insisted on. Students are satisfied with the most superficial idea of these special branches. Certainly, in this respect, the term “speciality” is an unfortunate one.

Students frequently regard such specialities as outside the pale of general surgery and medicine. They calculate that at most a question or two in such branches as otology or ophthalmology and laryngology in an examination is all they have to fear. In the eyes of students, too frequently the goal of their education is “their final.” They know that many examiners in general surgery are themselves devoid of an accurate special knowledge of these branches. Hence comes neglect

in the study of them, and the deplorable result that yearly a number of men are obtaining qualifications to practise who are totally ignorant of the advances which have been made in recent years in the diagnosis and treatment of the diseases of three of the most important organs of the body.

Ten years since I drew attention to the neglect in the education of medical students, and in the first edition of this work, as elsewhere, I strongly commented on this want in the schools. In 1881 the committee of the otological section of the British Medical Association reported as follows:—

“The committee is deeply impressed with the importance of the subject, and considers that the evident want of knowledge among practitioners in matters concerning ear diseases stands greatly in the way of their being able to deal promptly and effectually with cases of an acute character, and accounts for the very large number of neglected chronic cases which are met with in daily practice.

“After carefully considering all the suggestions received, and discussing the various means for promoting the study of aural surgery, your committee has arrived at the conclusion that all candidates for admission into the profession should have a practical knowledge of at least the essentials of otology, and that, as *compulsory* attendance on lectures and hospital practice might be deemed undesirable, the object in view can be best

attained by the licensing bodies including otology among the subjects for examination."

It is not so long since, when in conversation with an eminent surgeon, he thus briefly and tersely differentiated the causation, diagnosis, and prognosis of aural affections. "We may simply," he said, "divide all cases of deafness into wax and no wax; wax curable, no wax incurable." Did this assertion come within measurable distance of the truth, the therapeutics of aural affections would indeed be simple, and, as in days gone by, a syringe with soap and water would constitute the entire armamentarium of the practising surgeon. And I regret to say that there is still a belief, widely diffused, that there is something mysterious, or at the least most intricate, connected with the treatment of morbid states of the auditory apparatus, and this fear is expressed in the familiar injunctions given to sufferers "not to tamper," "to avoid meddling," "to let well alone," while these sapient precepts are perhaps carried into practice by the mischievous syringing on an exposed drum-head, or the dirty and dangerous practice of dropping greasy or fungus-generating fluids into the external meatus.

The excuse for all this empiricism of our forefathers has long since been removed. The time has arrived when aural therapeutics should be completely freed from the atmosphere of charlatanism which, in the minds of many, pervades the treatment of diseases of the middle and internal ear, and that the care of this most important organ should be as intelligently and rationally carried out as that of the uterus, the male urethra, or the rectum.

It would be easy to prove that the certainty of diagnosis is as perfect, both from positive signs and symptoms and from negative evidences, in the case of aural affections as in morbid states of other organs in the body. A glance at the method by which an exhaustive examination of the ear is conducted and a final verdict given must satisfy any one on this point. For my part, I know of no organs save the eye and skin in which we can arrive at more certain and satisfactory conclusions as to the cause of aberration or loss of function. He would be a rare diagnostician who would not acknowledge that in the case of the other

organs of sense, or of the internal viscera, conditions are occasionally met with which baffle his knowledge and contradict his experiences. The oculist and dermatologist have manifest advantages in the completeness of their survey of the diseased states they are called on to treat, and their powers of observation and comparison are accentuated by this facility and education.

But even in the instance of the eye and the skin, intricate questions of pathology which involve the diagnosis are constantly arising, and these baffle the localising power of the examiner, and more or less influence his judgment on matters of therapeutical import. It is no exaggeration to say that the vast proportion of curable or remediable affections of the ear are most easily diagnosed and require no extraordinary skill in their treatment; and these are just the conditions which come within the daily observation of the practitioner. I shall establish this assertion by a brief analysis of 2000 cases taken consecutively from my private notes and hospital case books. As I write this work from an experience derived from the treatment of over 5000 aural patients treated in hospital and private practice, and as by far the larger proportion of patients had both ears affected, this general judgment arrived at deliberately from that experience is worth stating.

Nor are the necessary appliances for an accurate aural diagnosis in the greater number of ear diseases met with in daily practice either numerous or costly. A watch, a few ear specula, a piece of rubber tubing, a laryngeal mirror, a tuning-fork, a syringe, an aural probe, with some cotton-wool, a tongue depressor, and, in some cases, a small Siegle's speculum, and Politzer's aural bag, are the essential tools which enable us, in a large proportion of cases, to tell the patient truthfully what is the matter and what are the chances of successful interference.

I conclude these introductory observations by a general reference to the manipulative experience and dexterity necessary in the application of local remedies to the external and middle ear. This experience is, I repeat, easily to be gained by the ordinary intelligent practitioner, and is not a whit more difficult

to attain than the acquisition of the corresponding dexterity and gentleness of touch which should be exercised in various other surgical procedures, as, for example, the manipulation and treatment of the sensitive urethra. It has, certainly, to embrace the ability for careful and accurate determination of the condition, normal and abnormal, of the external ear passage, and the nature of its contents; the ready recognition of the appearance and slight anatomical deviations from the typically normal shape, colour, position of the membrane, and which anatomical peculiarities are found in a certain proportion of ears in which the hearing power is perfect. On the other hand, there must be a familiarity with the alterations presented in the shape and position of the drum-head when it has been subject to repeated catarrhal attacks, or in those cases in which there have been chronic catarrhal conditions of the middle ear, conditions which induce rigidity of the ossicles and their articulations, with corresponding alterations in the tone and degree of

tension of the intrinsic muscles, and accumulation of mucus in the tympanic cavity, all of which departures favour the approach, and induce the occurrence of lesions of the external ear and its delicate nervous apparatus.

Thorough acquaintance with the use of three appliances is essential. They are diagnostic. These are the speculum, the otoscope, and tuning-fork. And when the physician comes, both for purposes of diagnosis and treatment, to apply remedies to the Eustachian tube and middle ear, he has to acquire the method of passing the Eustachian catheter with facility and gentleness. Both with mirror and finger he should know how to explore the naso-pharynx, the number of naso-pharyngeal cases in which we find deafness an accompanying trouble necessitating this knowledge, not alone for the ear but for the treatment of the attendant nasal and throat affections.

The nasal speculum, the laryngoscopic or rhinoscopic mirror, and a tongue depressor are not difficult instruments to master the use of.

CHAPTER II.

STATISTICAL.

DIFFICULTY OF ACCURATE CLASSIFICATION—BRIEF STATISTICS OF 2000 CASES OF DEAFNESS—CONCLUSIONS THEREFROM—NOTES ON 1000 CASES CLASSIFIED BY DR BARR—RELATIVE PROPORTION OF AFFECTIONS OF THE EXTERNAL, MIDDLE, AND INTERNAL EAR—DIFFICULTY OF DIFFERENTIATING MORBID CONDITIONS OF THE EAR.

I DIVIDE this first classification of 500 cases met with in private practice into three heads:—(a) affections of the external ear and meatus; (b) affections of the middle ear, including the membrana tympani, its muscles, the ossicles, the Eustachian tube; (c) the internal ear, including the labyrinth and auditory nerve.

In tabulating these affections I have placed each patient under that division which the most prominent symptoms and physical signs justified me in regarding as including the primary or principal seat of the disease and the part mainly involved. Obviously, in so large a number, where, as a rule, both ears were affected, other structures and parts were

involved than those which determined the final assignment of the case. This is one of the circumstances which make an accurate classification of aural diseases difficult. The removal of cerumen may disclose a perforation of the drum-head or some old catarrhal state, with its secondary intra-tympanic consequences, and further examination may demonstrate internal ear complications. A patient, on the other hand, may have the slowly progressive history and proofs of Eustachian deafness, resulting in both internal and middle ear mischief, but in whom all the evidence, aided by that derived from a throat examination, points to tubal collapse, enervation, or obstruc-

tion, as the principal source, both past and present, of the affection.

The skill of the aurist mainly consists in his power of comparatively analysing and differentiating these associated morbid conditions and in assigning relatively to each its proportionate part in the production of the symptoms for which he is consulted. He has frequently to decide how far the removal of those abnormal states which he knows to be remediable by operative or therapeutical measures will enable him to improve his patient's hearing, or, just as important a result, to preserve it. In a certain proportion of cases he must feel, no matter how large his experience, that the chances of improvement are against him; in another number he knows absolutely that no good whatever can be done. Frank admission in the case of both these classes of sufferers would save aural surgery from much of the suspicion of quackery, which at present is pretty openly hinted at, in regard to its therapeutical remedies and applications. "Don't you find aural practice very unsatisfactory in its results?" is a question which has been frequently put to me. And my reply, "Most decidedly not," has appeared to astonish my interrogators. I make the same response now, in a comparative and relative sense, taking into consideration the amenability of other organs to treatment, and remembering the proportionately large number of cases which are constantly occurring and which we must register as incurable, I care not what organ is instanced.

I repeat here what I have elsewhere stated—(a) that the broad principles of treatment are as easily, effectually, and safely carried out in the case of morbid conditions of the ear as in those of other organs; (b) that the most essential of those therapeutical principles, no matter how secured, are *cleanliness* (in the widest sense of the word); *free ventilation* of the aural passages; attention to the *healthy state of the naso-pharyngeal mucous membrane*; due regard to the intimate dependence of the normal auditory conditions on a healthful relation of all the delicate structures to their supply, and hence to the *state of the blood and the arterial and nervous systems*.

In the subjoined table thirty-three general and special vascular and nervous

patients were registered under two of the three divisions. I have also collected the entire number of patients from whom cerumen was removed, and those whose naso-pharyngeal tract was manifestly diseased.

Table I.

Total Number of Cases, 500.

External ear, including meatus	142
Middle ear, including the membrana tympani, the cavity of the tympanum and Eustachian tube	291
Mastoid process	5
Internal ear, including the auditory nerve and labyrinth	95
Total	533

Cerumen present	92
Naso-pharynx affected	88

This short table speaks for itself. In the first place it shows that more than fifty per cent. of these patients had middle-ear trouble of one kind or another. I shall subsequently give the number of these latter who had either suppurative catarrh, perforation of the membrane, or intra-tympanic polypus—a very large proportion. Secondly, it shows that in more than one-fourth the affection was limited to the external meatus (in the form of cerumen, abscess, polypus, or exostosis—more especially cerumen). Thirdly, it demonstrates that in between one-fifth and one-sixth of the entire number wax had accumulated in the meatus, and that naso-pharyngeal affections, such as nasal polypus, deviation of the septum, post-nasal catarrh, adenoid growths, follicular pharyngitis, hypertrophied tonsils, more especially the three latter, were co-operating causes.

I look on this number of patients, taken consecutively and without selection from my register of private cases, as a fair index of the general run of aural affections we are called on to treat in private. Table II. gives a more complete analysis of the diseased conditions met with in these five hundred patients. In the instance of perforation of the membrana tympani, I record the number of ears in which perforation existed. The other numbers refer to the patients affected, save where a different affection was present in the two ears.

Tinnitus aurium . . . present in 130 patients.

Table II.

External Ear and Meatus.

Cerumen (with collection of epidermis and fungus) . . .	present in	92 patients.
Tumour of auricle . . .	,	2 "
Injury or foreign body in the meatus . . .	,	21 "
Inflammatory states of the meatus . . .	,	24 "
Furuncle and abscess of the meatus . . .	,	28 "
Polypus of the meatus . . .	,	18 "
Exostosis . . .	,	13 "
Eczema . . .	,	12 "

Middle Ear and Eustachian Tube.

Myringitis . . .	present in	12 patients.
Catarrhal states of the tympani cavity and membrane . . .	,	200 "
Membrana tympani perforated in . . .	,	132 ears.
Acute and chronic suppurative catarrh present in		33 patients.
Collapse, closure, or obstruction of the Eustachian tube from various causes . . .	,	122 "
Polypus of the middle ear . . .	,	17 "
Mastoid process, affections of . . .	,	5 "

Internal Ear and Labyrinth.

Total number of patients with affections of . . .		95
Ménière's symptoms. present in		8 patients.

I think it well to supplement this classification by reference to another table of 1500 hospital patients. I cannot pretend that it is in any way as accurate a record as that of my private patients. It is simply compiled from the register of patients who attended the hospital, the special affection tabulated being that noted by myself or my clinical clerk in the extern department as the most prominent morbid condition at the time relief was sought. It was impossible to make a more accurate analysis, as many of the letters of the patients were lost, mislaid, or not returned. Though only seventy-one cases have been tabulated as suffering from affections of the internal ear, it is clear that when so large a number as 466 had chronic catarrhal conditions and complications present in the middle ear, such as adhesions, ankyloses, &c., the internal ear must also have been, in many instances, involved. Again, patients who had polypus growing from the tympanum or

membrane have not been separated from those in which it grew from the meatus. Lastly, 105 cases have been merely placed under the head of "Affections of the Middle Ear." Still I consider it sufficient of an index to the abnormal states of the ear we are called on to treat in everyday practice to induce me to make use of it, as well as the record of my private cases.

Let me note here that one-fifth of the 1500 hospital patients had cerumen, or accumulations of cerumen with epidermis, or of both with aspergillus present in the meatus. This corresponds pretty closely with the proportion in which cerumen was found in the meatus in the 500 private patients.

Again, if we take the entire number of the 1500 in which the principal mischief was discovered in the external ear, we find it to be (deducting polypus) 645 as against 210 of the 500, and while inflammatory states of the meatus with furuncle or abscess were present in one-tenth of the private patients, these conditions are noted in one-fifth of the hospital ones. The difference in the mode of drawing up these tables makes any further just comparison impossible. But it may be well to notice that both agree in demonstrating the large number of patients of all classes who suffer from perforation of the membrane, obstructed and collapsed conditions of the Eustachian tubes, and catarrhal complications of the tympanum. On the other hand, it is important to observe that of these 2000 patients, true exostosis in the meatus was present in only 18, that but 42 were seen in the early stage of acute inflammation of the membrane, and that only in this number was it possible to isolate the inflammatory state of the drum-head as the cause of pain, while about 5 per cent. had a polypoid growth either in the meatus or middle ear.

Table III.

External ear	645
Middle ear, including the membrana tympani, cavity of tympanum, and Eustachian tube	716
Mastoid process	7
Polypus (either of meatus or tympanum)	61
Internal car	71
Total	1500

Analysing still further the causes of

deafness in these patients, I find as follows :—

Table IV.

External Ear and Meatus.

Cerumen (with epidermis and aspergillus in some instances),	present in	295
Tumour of auricle	5	
Injury of auricle	4	
Congenital abnormalities of auricle	4	
Absciss of meatus	1	
Foreign bodies	18	
Inflammatory states of the meatus	179	
Furuncle and abscess	88	
Exostosis	5	
Eczema	46	

Middle Ear and Eustachian Tube.

Myringitis	present in	31
Catarrhal states of the tympanic cavity	202	
Collapse, closure, and obstruction of the Eustachian tube from various causes	159	
Unclassified affections of the middle ear	105	
Membrana tympani perforated in	218	
Polypus of external or middle ear	61	
Mastoid process	7	

Internal Ear and Labyrinth.

Affections of (registered)	71
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There are some broad conclusions which may be drawn from these tables.

(1) That a very large proportion of the aural affections for which we are consulted, both those of an inflammatory character and those in which there is deterioration of function, is due to essentially preventable causes, or causes over which the controlling influences within the reach of every physician and surgeon can be exerted so as either to prevent or minimise their pernicious effects.

(2) That the external ear furnishes a large proportion of the diseases we are called on to treat, and that (to take a low estimate) in some 40 per cent. of such patients cerumen (and its associated and attendant evils) is the primary cause of the trouble, and produces the symptoms for which we are consulted; and that of the remaining affections of the external ear, inflammation of the meatus, in various degrees and stages, is the condition we have most frequently to combat and limit.

(3) That chronic, dry, or moist catarrhal states of the middle ear furnish the next largest number of patients, associated with which we frequently find closed, obstructed, or collapsed Eustachian tubes. Of the 2000 patients tabulated, more than one-third distinctly came under this

head, and in over one-third of these closure or obstruction of the Eustachian passage was registered. But this, as I have already shown, is to be regarded as only approximately accurate, as in the classification of a large proportion of these cases the secondary condition has not been included. This applies more particularly to the hospital register. I should say that at least two-thirds of these "middle-ear" cases were complicated with, or owed their intra-tympanic mischief to, Eustachian collapse or closure.

We may also, I think, draw this general conclusion, which has an important bearing on aural therapeutics, viz., that the practitioner in daily practice has principally to deal with two causes of inflammatory affections of the ear and deafness,—in the external ear accumulation of cerumen and its accompaniments, epithelium and fungus; in the middle ear tubal collapse and closure and obstruction. Side by side with this inference I would notice the number of cases of perforation, both acute and chronic, of the drum-head. Perforation was present in 132 ears out of the 500 private patients; and 218 of the 1500 hospital cases had an opening in the membrane of one or both ears. This would represent over 17 per cent. of the entire number of patients as having had a perforation of the membrane in one or both ears.

Analysing a report of 1000 cases of ear disease treated in the Glasgow Western Infirmary, published by Dr Barr, we find that the auricle and auditory canal were affected in 14 per cent., the middle ear (tympanum, Eustachian tube, and mastoid cells) in $81\frac{1}{2}$ per cent., and the internal ear in $4\frac{1}{2}$ per cent. Of the 1000 cases, the same disease existed in both the ears in 516 persons, and a different diseased state in each ear in 88 persons. The very small proportion of internal ear affections Dr. Barr accounts for by the exclusion of all cases save those in which the nervous apparatus was primarily affected. But he is careful to remark that "the cases in which the inner ear becomes gradually involved are generally the result of the extension to the structures of the labyrinth of disease which has begun in the middle ear." It is worthy of notice that of these 1000 patients only two suffered from exostosis of the meatus, in one of these both ears

being affected. Three patients presented themselves with polypus in the external meatus, and 65 with polypi growing from the walls of the tympanum. Only three cases are recorded of acute myringitis. One is at once struck, as in my tables, with the large proportion of middle-ear diseases, and more especially of catarrhal states, acute and chronic. Also it is worthy of notice that in twenty-three only were the mastoid process and cells affected.

It will be noticed that the proportion of internal ear affections appears from the registered number of cases, 184 out of 2000, to be relatively small. This would be a most misleading inference to draw from any statistical table or classification of ear affections. It is an easy task to assign to the division of internal ear disease a well-marked case of nervine deafness, labyrinthine vertigo, the combination of objective signs and subjective symptoms, which we group together under the name of Ménière's disease, or those numerous cases in which from disease or accident we can have no doubt that permanent lesions, traumatic in origin or the consequence of apoplectic, acute inflammatory, or degenerative changes in labyrinth or cochlea, exist.

But to accurately differentiate these morbid conditions, such as true paralytic states from localised nerve lesions, limited effusions of blood or serum, simple functional disturbance and paresis, from organic mischief in the nerve elements, is, we have to confess, in the present state of our knowledge and the scanty clinical and pathological data, often impossible. This is the weak side of otological science, and an unfavourable comparison can justly here be made with

ophthalmological research and knowledge. Yet it is established by all past pathological evidence, that serious lesions of the middle ear—take especially suppurative catarrh with extensive perforation in the membrana tympani and old catarrhal conditions of the mucous membrane of the cavity of the tympanum—lead up to, and are attended by varying degrees of internal ear mischief, both in the labyrinth and cochlea. And, therefore, in such a classification as that which I have presented, it must have happened, and the general experience of the results of treatment prove this to be true, that the internal ear structures were likewise, to an extent, involved though not included at the time. How far such involvement, apart from these middle-ear affections, depends on constitutional or systemic states, and morbid changes in other organs, or to acute disease or general decay, it is our obvious duty to try to determine. At times the attempt is an impossible one; at other times the more remote source of the symptoms is immediately obvious. Under any circumstances it does not affect our duty to determine the part taken by the local lesions in the production of these symptoms, and our treatment so far of it. But over these internal-ear lesions experience proves we have little power. If present, and due to such constitutional states as general plethora, syphilis, gout, struma, and such organic conditions as cardiac disease, albuminuria, diabetes, we may do much by general and specific treatment to modify or ameliorate—we rarely cure—so that their presence does not affect the question of local treatment. It is rather one of diagnosis and prognosis.

CHAPTER III.

ETIOLOGICAL.

INSIDIOUS ADVANCE OF DEAFNESS—CAUSE OF DEAFNESS IN 237 INDIVIDUALS—GENERAL OBSERVATIONS ON THE FOLLOWING CAUSES OF EAR AFFECTIONS: SCARLATINA—MEASLES—NASO-PHARYNGEAL CATARRH—HEREDITY—INJURIES, BLOWS, ETC.—BATHING—SYPHILIS—LEUKÆMIA—MENSTRUAL DISTURBANCES—CARDIAC LESIONS—FEVERS—GOUT—CLIMATE, ETC.—CONCUSSION AND GUN PRACTICE—QUININE—ANÆSTHETICS AND MORPHIA—OCCUPATIONS—RAILWAY TRAVELLING—MILITARY LIFE—NIGHT-NURSING—TRADES—SYRINGING.

WOULD first make some general observations on the origin of the deafness, or rather on its ascribed source in about fifty per cent. of the 500 patients who were able to trace either the deafness, pain, or inflammation to some definite cause. In over fifty per cent. no predisposing cause could be assigned or discovered for the ear affection. In many the deafness crept on insidiously, without pain, and not until conversational power suffered either through the more obvious difficulty of hearing the voice when spoken to, or that more slowly perceived proof of mischief, the inability to hear general conversation at table and in society when several people are speaking at the same time, did the patient realise the fact that any impairment of hearing threatened.

Less frequently in the case of the ear than of the eye does the failure of the hitherto perfect organ awaken the person to the fact that some imperfection has already existed, which has passed unobserved until both organs begin to suffer in function. And, so long as the hearing distance is sufficiently good for the ordinary conversational business or professional necessities, the slight beginnings of deafness passed unheeded and undetected. It is with difficulty that we can at times persuade a patient that the hearing power is not as good in one or both ears as it might be. Particularly is this the case when we are consulted for tinnitus without any considerable impairment in the hearing. The persistence of the noise, of whatever kind it be, is the first warning of the future decadence which follows the early perversion of the function.

Just as we should never neglect

occasional or persistent pain in the ear, so should we always be mindful that tinnitus is a warning symptom, not alone of local auditory derangement, but frequently is it the danger signal of more remote mischief in the brain, heart, or general vascular system. Of the patients asked if they could ascribe any cause for the trouble for which they sought relief, I have only recorded the answers of those who appeared certain that there were good grounds for attributing it to some diathesis, illness, accident, habit, or occupation.

Scarlatina	.	.	.	.	.	45
Cold (principally naso-pharyngeal catarrh)						36
Hereditary (father or mother deaf in fifteen cases)	.	.	.	.	.	24
Injuries and foreign bodies	.	.	.	.	.	21
Sea-bathing	.	.	.	.	.	13
Measles	.	.	.	.	.	11
Uterine functional disorders	.	.	.	.	.	9
Neuralgia	.	.	.	.	.	8
Syphilis	.	.	.	.	.	8
Anæmia	.	.	.	.	.	8
Cardiac disease	.	.	.	.	.	8
Fever	.	.	.	.	.	6
Gout	.	.	.	.	.	5
Congenital	.	.	.	.	.	5
Tropical or climatic	.	.	.	.	.	5
Alcoholic excess	.	.	.	.	.	4
Ozena	.	.	.	.	.	4
Gun practice	.	.	.	.	.	3
Mental worry and shock	3
Puerperal	3
Diphtheria	2
Nasal polypus	2
Rheumatism	2
Struma	2

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I have already shown that 92 patients had cerumen in the external meatus, and that 88 suffered from various throat and naso-pharyngeal affections.

Some deductions from this table of the causation of aural diseases may be drawn.

SCARLATINA.

It will be noticed that scarlatina was directly or indirectly the source of the affection in nearly one-fifth of the cases. A very large proportion of these patients had perforation of the drum-head in one or both ears. Several suffered from acute suppurative inflammation during the illness; in others the perforation or catarrhal state was secondary to the exanthem. From this at least we learn the practical lesson of the paramount importance of close attention to the ear during the scarlatinous fever and the period of desquamation, seeing how frequently an affection of the ear, often producing total deafness by destruction of the tympanic membrane or the ossicles, is one of the sequelæ. Here, if the practitioner has not the necessary skill to puncture, at the right moment, a bulging pocket of the membrane, or that he finds it difficult, from the age of the patient, to carry out this operation, close attention to the cleanliness of the external meatus and the naso-pharyngeal tract will do much to limit mischief and prevent destructive suppuration in the auditory passages. And it should be clearly understood that nothing save the lamentable ignorance of the benefit derived from this salutary step can explain the large number of terrible cases of destructive inflammation of the middle ear, with its permanent deafness occurring during and after scarlatina.

To permit accumulations of pus to gather in the tympanum, the exit of which is prevented by the drum-head, when destruction of the ossicles, collections of pus in the mastoid cells, abscesses, widespread inflammation, and large ragged perforation of the membrane itself, may finally result, is, in the face of our present knowledge, highly culpable. Indeed, we must acknowledge that a large percentage of the cases of post-scarlatinal deafness, with perforation of the membrana tympani and other lesions, is the result of carelessness or the want of due attention to the throat and ear complications both in the acute stages and during convalescence. Doubtless in some cases the fearful rapidity, the malignity, and the severity of the constitutional fever absorb all the attention. Yet where this is not the case,

sufficient thought is not bestowed on the throat and nasal passages, the naso-pharyngeal, and palato-pharyngeal tracts.

The frequent cleansing of these parts by douches, washes, or sprays, disinfectant and astringent, applied both through the nose and mouth, as well as the occasional washing of the parts out with a brush (solution of perchloride of iron and glycerine, chloride of zinc and glycerine), carried well up behind the soft palate, is essential in dealing with the Eustachian complication.

But it is even more necessary to say a word of caution in regard to the case of scarlatina patients when they are convalescent. Frequently no pain or discharge has attracted attention to the ear or the hearing, nor has there been any aural mischief apparent in the acute stages, while the throat complications have induced a catarrh of the tympanum and chronic otitis, having as its accompaniment a swollen and obstructed Eustachian tube, with imprisoned mucus, all of which troubles are apt to be exaggerated during the desquamating period by the general debility and prostration consequent upon the attack. Then it is that we frequently find the otitis resulting in perforation, with catarrhal discharge, sometimes without pain, and consequently neglected by parents, until the deafness attracts attention, or it may be that an acute inflammatory attack of the membrana tympani runs rapidly on to perforation, and the pent-up secretion finds a vent in the ruptured drum-head. It is in cases such as these that the intelligent surgeon has in incision of the membrane a safe and ready means of preventing both further aural mischief, and often, the attendant or consequent cerebral complication. We shall refer again to this matter in speaking of inflammation of the tympanum and otitis media.

MEASLES.

Measles is not without its risk of impairing the hearing. I have found that catarrhal states of the tympanum, with some collapse of the Eustachian tube, are the conditions we most commonly find as sequelæ of measles. The coryza and nasal catarrh, with the attendant swelling of the naso-pharyn-

geal mucous membrane, account for this result. The same precautions which are indicated during convalescence in the case of scarlatina are required after measles. A little care and watching are sufficient to prevent any permanent injury.

NASO-PHARYNGEAL CATARRH.

Next on the list we find "*cold caught*" the most frequent source of trouble. That recurrent and troublesome visitor, "*a cold in the head*," with its attendant euryza, being the attack principally referred to.

I only here briefly refer to other naso-pharyngeal affections, inasmuch as these conditions will be fully dealt with in discussing the various aural affections attributable to their presence.

The most commonly met with of these naso-pharyngeal affections are:—
(a) naso-pharyngeal catarrh, acute and chronic; (b) hypertrophy and parenchymatous thickening of the nasal and naso-pharyngeal mucous membrane; (c) follicular hypertrophy, cytogenic states, and granular conditions of the naso-pharynx; (d) enlargements and morbid growths from the inferior and middle turbinated bones; (e) enlarged tonsils, adenoid growths of the naso-pharynx, or of Luschka's tonsil; (f) paretic states of the naso-pharyngeal muscles; (g) deviations of and growths from the septum; (h) syphilitic affections of the naso-pharynx.

Frequent catarrhs, both of nose and throat, are common causes of catarrhal conditions of the membrane and drum cavity.

The temporary swelling and closure of the Eustachian tube—with the consequent interruption in its valvular function, independently of the imprisonment of secretion in the tympanic cavity, is a sufficient explanation of this result. The delicate Eustachian, as well as the intrinsic tympanic muscles, are included in the inflammatory process, so that the temporary atonic state is frequently succeeded by a prolonged, if not permanent, enervation. The recurrence of attacks increases the danger and brings on the periodical deafness or slight dulness of hearing. The intermittent hum or buzz of tinnitus becomes in time a permanent defect, and there is a constant

tinnitus. Thus each catarrhal attack is remarked by the patient to favour the symptoms of deafness and noise in the ear, but as these subside little attention is paid to them until the permanent deafness necessitates advice.

The same observations apply to attacks of tonsilitis, and so we find the ordinary "sore throat" a frequent precursor of aural mischief. Draughty places, exposure to cold air and a keen wind, rapid changes of temperature, carelessness after exercise and chill, are the occasional causes of abscess or myringitis. Nor is the relation of pharyngeal inflammation and tonsilitis to miasmatic or septic surroundings to be forgotten in the etiological consideration of external and middle-ear catarrhal inflammation. The same impure atmospheric or contagious influences operate in both instances.

And it must frequently happen that these prevalent zymotic conditions accentuate the aural as they do the throat trouble; or it may be that under the favouring conditions of confinement of organic particles in the limited space of the Eustachian tube and tympanic cavity, with the increase of temperature and the accompanying moisture, fermentative changes are here more readily induced, as we know they are from similar causes operating in the external ear passage in the instance of furuncle.

Again, we may derive a valuable therapeutic lesson from these facts. We should attend closely to the ventilation of the aural passages and cavities during these catarrhal states. At the same time the faecal orifices of the Eustachian tubes should be kept patent. Patients should have impressed on them the danger arising from recurrences. Warmth of the extremities should be insisted on. The feet should be kept warm and free from damp (see chapter on Hygiene). "Colds in the Head" should be cut as short as possible, and the throat and nasal passages should be seen to when the cold has passed over. Antiseptic, alkaline, and astringent agents may be combined in vapour, spray, and gargle, and the frequently existing atonic muscular state can be counteracted by change of air, local astringents, and general tonics. Most necessary is it to warn patients of the slow and imperceptible advance of

this catarrhal deafness. Free inflation of the ear and attention to the nose and throat, in the manner hereafter to be described, would save the hearing of many an ear and much subsequent useless interference if resorted to early.

HEREDITY.

That deafness is one of those ailments which nature entails as a hereditary reminder of parental imperfection is well known, and in it frequently we have a good exemplification of the law of atavism ; the defect appears to skip one generation, and to reappear in the next.

I have just at present a lady under my care who is very deaf, and whose mind is beginning to fail. She is one of a family, two other members of which are deaf. Deafness has been transmitted for generations ; and, coincident with the deafness, there is also a family history of insanity.

Occasionally, though we cannot find evidence of deafness in the parents, curiously enough two or three brothers or sisters are affected. The deafness at other times will be found at the father's or mother's side, while the parents have escaped. Such hereditary deafness is nearly always of a most unfavourable type, and treatment generally ends in a negative result. In a great many cases the physician does not see the patient until the deafness is far advanced and there is evidence of serious middle and internal ear trouble.

The lesson, obviously, that we may gather, is, to attend, in all such families, to any early indication of approaching mischief, and to lessen the chances of it by looking after the throat and tonsils and any nasal obstruction or abnormality which may exist in childhood. For it is the fact, and a most vital one in regard to this form of deafness, that we frequently find it first make its appearance after puberty, or even later on.

INJURIES, BLOWS, ETC.

Rupture of the drum-head, extravasation of blood into the cavity of the tympanum or the internal ear, with some lesion of the nervous structure, are a few of the consequences of injuries to the ear—blows, falls, explosions, &c.

Every medical man should discountenance the habit, unfortunately only too prevalent, of boxing the ears of children. More than one fatal case has occurred from the injuries thus inflicted—rupture of the drum-head, bleeding into the middle ear, otitis media, extension of the mischief to the brain have followed.

These cases cited by Dr Cassells exemplify the results which may follow both these practices (*Specialist*, April 1, 1881) :—

A. L., aged 13, received a few weeks previously several blows on her right ear from the schoolmaster. On inspection the membrana tympani on right side was ruptured in its anterior quadrant, acute muco-tympanitis following. Treated by rest and antiseptics. She recovered.

R. M.D., age 6. Four years ago right ear began to discharge, and has continued to do so more or less since then, after having his ear pulled at school. On examination, it was seen that the right membrana tympani had been ruptured. This case was one of traumatic rupture of membrana tympani, followed by chronic muco-tympanitis. Patient was dismissed cured in four weeks, hearing quite well.

Quite recently I had a case, a policeman, who in a scuffle received a blow of the fist over the ear ; there was some haemorrhage at the time. I saw him subsequently ; there was a rent in the membrane, and this lesion was attended with complete deafness and the most distressing tinnitus. Not alone should slapping children on the ear be prohibited, but a kindred practice nearly as injurious, namely, pulling the auricle. Not long since I had a case where severe inflammation of the auditory canal followed on “pulling of the ear.” It would be well to impress these facts on all parents and school teachers.

FOREIGN BODIES.

I consider the question of the mode of removal of foreign bodies worthy a special notice in this work (see chapter on the External Meatus—Foreign Bodies). It is just one of those practical matters that practitioners have daily to decide, and without consultation. Here, however, I may relate this curious case of prolonged tenancy which lately came under my notice.

A lady, aged 22, had when a child put some grains of No. 5 shot in her right ear. She never had these removed, and their existence was overlooked and the act forgotten. No pain or uneasiness followed. Some time before I saw her she was told she had wax in the ear, and in the act of syringing, a surgeon removed a grain. It was then thought that all was right. Feeling the ear still uneasy, and some tinnitus remaining, which did not yield to syringing, she was brought by a medical friend to me. I thought I had impacted cerumen to deal with, seeing some hard wax at the bottom of the meatus. On removal of this, however, I discerned something in the nature of a foreign body. I persevered in the syringing, and, surrounded by a layer of wax and epithelium, out came another grain of shot, which had snugly lain there all these years. I saw this lady about one month afterwards. The membrane was normal in appearance, and the hearing distance perfectly restored.

BATHING.

Bathing, especially in sea-water, is an important and frequent cause of impairment of hearing, resulting in tympanic inflammation, the consequence of the passage of sea-water into the tympanic cavity. Constantly I have been consulted for deafness produced by sea-bathing. In the cases I have seen, the general conditions have been thickening of the membrane, fluid in the tympanic cavity, and closure of the Eustachian tube.

I have before noticed the occurrence of exostoses within the meatus in persons fond of sea-bathing. In some there has been either a recent or remote history of inflammation in the auditory meatus, with pain; but frequently all that the patient complains of is tinnitus aurium, accompanied with deafness, which, though at first slight, goes on steadily to a most unpleasant and troublesome pitch.

"The symptoms," Turnbull says, "of water in the middle ear are, in the first stage, an uncomfortable sensation, followed by earache or pain, which after a time becomes agonising, and is accompanied with great tenderness behind the auricle." The accident does not so often occur with expert swimmers as with the young and inexperienced, who in diving

or otherwise from the shock or cold involuntarily fill the mouth and pharynx with cold sea-water, a portion of which passes into the open Eustachian tube and tympanic cavity. In such cases the mischief may before long extend to the brain, and the most alarming symptoms, delirium and coma, result. Inflammation in the cavity of the tympanum, extending to the naso-pharyngeal tract, is followed by a purulent effusion, which immediately indicates incision of the membrana tympani to give exit to the pus. If there be a discharge, chronic in character, from the meatus, Turnbull advises a powder of "salicylic acid and starch, blown into the meatus, and after a time washed out, reapplied twice daily until the discharge has ceased, and the perforation has healed."

I have not seen many acute cases; but I have frequently observed instances of permanent and incurable deafness, with troublesome tinnitus, in which the origin of the affection was clearly traced to bathing. In the more recent and milder cases, I have had the best results from warm alkaline injection into the tympanum with the Eustachian catheter, and the use of the air douche.

Frequently we are asked our advice as to the prudence of bathing by aural patients. It is well to remember these dangers, especially when perforation of the membrane is present, or inflammatory and altered states of the tympanic membrane or cavities. I never permit an aural patient to plunge into cold water. Turnbull advises the head to be placed to one side, holding the ear well out and opening the mouth, when water is found to enter the ear. The aural protector of Dr Ward Cousins is useful when bathing; failing which, a little cotton-wool should be worn.

SYPHILIS.

The small proportion of the private cases in which syphilis could be said to play a direct part in producing the ear affection is noticeable. Eight patients had had severe primary syphilis, and the deafness arose as one of the secondary and tertiary symptoms of the exanthem. But of those who suffered from naso-pharyngeal trouble only a small proportion had post-nasal catarrh and congenital

evidences of inherited syphilis in the teeth and cornea. More frequently have I seen such cases in the hospital clinique. The presence or reminiscence of interstitial keratitis, the characteristic teeth, the nasal speech, the post-nasal affection, are clear evidences of inherited taint. Yet it must not be forgotten inherited syphilis is a frequent source of ear mischief in children. It is difficult to say when the morbid changes which bring about this form of deafness commence. Struma and syphilis have both their share in producing aural complications in young children. But while the symptoms which are observed in the young child and infant are frequently attributed to the former, the presence of the latter disease is overlooked.

In many obscure cases, where there is no proof of the parents being strumous, and no appearance of a strumous diathesis in the child, the search must be cautiously but carefully made for a syphilitic origin. More particularly is this necessary in those acute cases which we occasionally meet, when a child or young infant is attacked rapidly with inflammation in the middle ear, followed by profuse otorrhœa, and perhaps convulsions and death. In such a case that I saw lately there was general blood-poisoning and collections of pus formed in different parts of the body; the attack was ushered in with snuffles and an abscess over the antrum. The father had contracted syphilis, and the previous children had all died shortly after birth.

Suspicions must be awakened by such a history, and it should not be overlooked, both for the sake of the patient and surgeon. Those cases are most frequently met with in which the child has never heard well, there has been no history of discharge, and when there has been no complaint of pain. These children, particularly amongst the poorer classes, are not brought in the earlier years of childhood, and we are not often consulted until the growing deafness has become so inconvenient, at or about the age of puberty, that the parents are forced to take advice.

The symmetrical nature of these cases, as pointed out by Mr Hutchinson, does not assist us much in the diagnosis. The presence of the characteristic teeth, also described by him, the coincidence of

syphilitic lesions of the cornea, the proofs of old skin affections, and the general characteristic appearance with which we become familiarised on seeing a number of such cases, will confirm the diagnosis. It is generally for the deafness with the post-nasal catarrh and ozænous discharge that accompanies it that such cases are brought. The dull cornea, the nasal speech, the deformed teeth sufficiently distinguish them.

It must be remembered that we have Hinton's testimony that one-twentieth of the cases of deafness attending Guy's Hospital had as their cause hereditary syphilis. This proportion has certainly not been nearly so great in the cases under my care. This, of course, would be accounted for by the greater prevalence of inherited syphilis in such a city as London. The three following cases are typical of the hereditary syphilitic class:—

Mary A., orphan, aged 18. Could trace no family history; has always been deaf; barely hears the watch in contact with the left ear, altogether deaf with the right. There has never been any pain or discharge; cornea of both eyes is dull. There is a peculiar nasal voice, and a difficulty in pronouncing some words. The external meatus of either ear is healthy; the membrana tympani of both is concave and dull, with a prominent malleus. Eustachian tubes are patent. She hears a tuning-fork well in both ears when placed on the head, the sound becoming duller on closure of the ear; tonsils congested, teeth normal.

A. M. H., female, aged 15. Her father, who is dead, was affected with deafness. She has been deaf since childhood, and the deafness has greatly increased of late. The cornea of both the eyes is dull, and there are old interstitial deposits. The hearing is almost completely destroyed, neither loud noises nor conversation in the loudest tones are heard. The external meatus is healthy, the membranes are extremely concave and dull, with large pockets; the Eustachian tubes are closed; she has the same peculiar lisp and difficulty of pronunciation as in the last case; the teeth are partially syphilitic and discoloured.

Miss—, aged 15, consulted me, Nov. 1874, for old interstitial keratitis. She was the first child not still-born of the

family; all the previous children were syphilitic. She has also now slight deafness and typical syphilitic teeth. Her eyes were healthy until she was five years old, when she had an attack of interstitial inflammation of the cornea, and a second attack supervened five years subsequently. She had the peculiar look and curious articulation which I have noticed in some of these patients.

Let me refer briefly to the teeth here alluded to, and which have been described by Mr Hutchinson as characteristic of hereditary syphilis, and ask attention to the distinction drawn by him between the teeth of persons affected with hereditary taint, and those who have had mercury administered in infancy, and who have, as a consequence, the teeth of mercurial stomatitis.

MERCURIAL STOMATITIS.	HEREDITARY SYPHILIS.		
Teeth primarily affected = }	1st Molars, { Central upper incisors.		
Premolars escape.			
Character of abnormality, =	<table border="1"> <tr> <td>Enamel deficient, transverse lines on incisors and canines, dirty, discoloured, and coated with tar-tar; pitted.</td> <td>Peculiar notch in incisors, dirty, badly formed; often combination of effects seen in deficient enamel and dentine from mercury and syphilis.</td> </tr> </table>	Enamel deficient, transverse lines on incisors and canines, dirty, discoloured, and coated with tar-tar; pitted.	Peculiar notch in incisors, dirty, badly formed; often combination of effects seen in deficient enamel and dentine from mercury and syphilis.
Enamel deficient, transverse lines on incisors and canines, dirty, discoloured, and coated with tar-tar; pitted.	Peculiar notch in incisors, dirty, badly formed; often combination of effects seen in deficient enamel and dentine from mercury and syphilis.		

See Hutchinson's *Illustrations of Clinical Surgery*.

Dr Pierce, of Manchester,¹ gives the following summary of the characteristics of acquired and congenital syphilis:—

1. Extreme degree of deafness manifested early in the progress of the disease.
2. Rapidity of progress and absence of pain.
3. Early and extreme loss of hearing for the tuning-fork over the vertex.
4. Frequent imperviousness of both Eustachian tubes.
5. Constancy of the tinnitus, of a hissing kind.
6. Frequency of simultaneous inner symptoms.
7. Improvement of pre- or co-existing eye affection.
8. More decided affection of the nasopharynx than in catarrhal ear disease.
9. Less complete recovery than in simple catarrh.

I have remarked that in many of the patients there is no abnormal appearance of the membrane that can be looked on as pathognomonic. In several others I

have seen the membrane dull and thickened, it has lost its transparency, is rather of a grey colour, and inflates with a dry click. I believe, however, that it is *impossible* to define any typical appearance in this affection, in which I regret to say that treatment has with me proved of little avail. If taken in the early stages, or when the symptoms first manifest themselves, much may be done by mercurial treatment (lanolin inunction), followed by the three iodides or iodoform given internally, at the same time that the Eustachian tube is attended to and the tympanum kept free by warm iodide of potassium or chloride of ammonia injections. But when a case comes with extreme deafness (both with the watch and tuning-fork), and presents the characteristic teeth of Hutchinson, and the proofs of an attack of interstitial keratitis, either remote or recent, I do not hope for a good result from any treatment.

Primary syphilis of the ear must be extremely rare. I have never seen a case. Syphilis, however, occasionally, attacks the ear in the form of secondary cutaneous eruptions or condylomata of the auricle. I have seen many well-marked cases of syphilitic secondary affection of the middle ear of a chronic catarrhal, non-suppurative nature. The majority of the patients being for a time periodically under observation, ultimately yielded to constitutional and specific treatment. In some cases, occasionally, with accompanying syphilitic retinal affections, I have had evidence of internal ear mischief, tinnitus, giddiness, cranial, or occipital pain, with deafness. In secondary syphilitic patients, in addition to such treatment as inunction, iodoform, iodide of potassium, I have found the greatest and most permanent benefit from a course of baths and the treatment of Brandis at Aix-la-Chapelle.

In the chapter on aural vertigo I refer to the use of pilocarpine in secondary syphilitic lesions of the labyrinth.

ANÆMIA AND LEUKÆMIA.

Anæmic conditions of the blood, often attended by *neuralgia*, are responsible for that tinnitus which I think we may truly call anæmic tinnitus, at the same time that there is induced a general state of

¹ International Congress, 1881.

éervation of the tubal muscles and consequent intra-tympanic changes, with corresponding alteration in the shape and tension of the membrana tympani. These are typically the cases which do well with change of air, a trip to St Moritz, or some mountain health resort in the Upper Engadine, or, if this cannot be afforded, any of our elevated home sanitaria. At times a stay at the seaside will charm away these anaemic noises. It is well with this change to combine a course of arsenic and iron, with perhaps quinine and nux vomica.

It is in such persons that we occasionally find a vascular tinnitus ascribed to mental overwork and worry. It is in these mentally overworked patients that alternations in the tension of the tympanic vessels, whether it be excess or diminution, bring about tinnitus and ultimately deafness from the combined causes, vascular disturbance and irregularity of the blood supply, and enervated muscles (see chapters on *Tinnitus*).

LEUKÆMIA.

In a communication which was read at the International Otological Congress at Basle, in 1885, Professor Politzer dwells on the comparatively backward state of our knowledge of the pathology of the labyrinth, and hence the want which is felt of a sound pathological and anatomical basis for the therapeutics of the internal ear. This is to be attributed not alone to the difficulties in obtaining autopsies in cases in which microscopical examination might afford a clue to the clinical features, but also to the time required in making such investigations in the case of disease of the labyrinth. The principal obstacle hitherto met with in making histological examinations of the labyrinth lay in the disturbance of the topographical relations of the sacculi and ampullæ with the membrana tectoria and membrana Reissneri produced by the sections. This has been in great part overcome by the fixation of the membranous labyrinth and the organ of Corti through the forcing into the labyrinth of a solution of celoidine in diluted alcohol; the examination can thus be made without any alteration in the original position of these parts.

In a case of intense leukæmia com-

plicated with deafness, Professor Politzer was enabled to make a satisfactory examination of the internal ear after death. There was during childhood an otorrhœal discharge from the left ear. At twenty years of age the patient suffered from intermittent fever, which was attended by an oedematous state of the feet and abdomen. Three years later he contracted syphilis. In December 1881, being then in his thirty-first year, he became suddenly deaf during the night, the deafness being complete, following on attacks of dizziness, with symptoms of ocular migraine and accompanied by tinnitus aurium. Great diuresis, increase of the anasarca state, intense debility; dyspnoea with other lung symptoms followed, and these were attended by loss of vision.

Shortly before death these notes were made in the clinique of Bamberger (September 1882):—"Extreme cachexia, emaciation, anaemia, skin pale and oedematous, the extremities being covered with an impetiginous eruption, not syphilitic but consequent upon the general anasarca. The sternum and ribs were very sensitive to pressure, the liver and spleen were enormously enlarged, the cervical, axillary, and inguinal glands being also enlarged. The urine was albuminous, and microscopic examination of the blood showed evident increase of the colourless corpuscles. The membrana tympani of the right ear was dull, drawn in, and greatly contracted, that of the left was entirely destroyed with the tympanum itself, while there was complete paralysis of both auditory nerves." He died of a general increase of the leukæmic state, anasarca, and pleurisy.

The diagnosis of general leukæmic infiltration was verified by the autopsy. The liver and spleen were enormously enlarged by leukæmic deposit, the mesenteric glands being swollen into large, irregular, yellowish-white tumours, in places the size of the closed fist. All the peripheral lymph-glands likewise were enlarged. The muscular structure of the heart was in a state of fatty degeneration. The medullary substance of the sternum and ribs was of a raspberry-jelly substance and full of white blood corpuscles, the bones themselves being softened and rarefied. The mucous

membrane of the tympanum of the right ear was somewhat swollen, the membrane was drawn in, there was rigidity of the malleo-incal and stapedial joints, with increase in size and diminished movement of the latter. In the left tympanum the stapes alone remained, the malleus and incus being absent. The petrous portions of the temporal bones were found bleached.¹

The microscopical appearances as seen in a section of the right labyrinth, made from the point of the pyramid towards the base from behind and inwards, are especially worthy of note. The scala tympani was seen penetrated by an irregularly-branched framework joined to the walls of the cochlea and extending from the base to near the last winding. The cochlear spaces were filled by connective tissue, in some parts ossified, so much so that the osseous spiral lamina was bulged out and pressed against the scala vestibuli. This latter was so contracted that in some places it was reduced to a quarter its normal width. In other portions of the cochlear canal, in the scala tympani and scala vestibuli and lamina spiralis, the connective tissue was less developed, and on the spiral lamina there was a circumscribed layer of coagulated lymph-cells, having the character of a recent leukæmic exudation. Exudative masses were found in the cochlear walls of the scala vestibuli. Similar exudations and tissue formations were found in the spaces between the membranous and osseous semicircular canals, the membranous canals themselves being filled in many places by the same coagulated lymph-cells. The vestibule exhibited like changes.

The left labyrinth presented kindred appearances, perhaps in a less degree, and the petrous bone had in it analogous changes to those found in the ribs and sternum. The neoplastic bony framework, the proliferating connective tissue, the exudation corpuscles, were all the result of the chronic inflammatory process going on in the endosteum of the walls of the labyrinth.

The fibres of the auditory nerve were varicosely swollen, and the nerves of the modiolus and the spiral lamina were pass-

ing through a fatty degenerative change, while the ganglion cells in the spiral ganglion were in part decayed, in part horny or infiltrated with fat. We learn a lesson, as Professor Politzer remarks, of the uselessness of any therapeutic measures in the face of such pathological changes as these. The entire case is one of extreme importance. There does not appear to have been any ophthalmoscopic examination made of the retina. But the blindness which accompanied the deafness we may assume was due to leukæmic changes in the retinal elements, probably thrombosis.

These local pathological conditions have their main interest for the otologist in their relation to the occurrence of the group of symptoms we meet with in Aural Vertigo.

URÆMIA.

Uræmic conditions are a common cause of tinnitus. Deafness is not so frequent—and is more transitory or occasional. In the uræmia of pregnancy tinnitus may be an early indication of the presence of albuminuria. Retinal disturbances and aberrations of vision accompany the auditory symptoms.

In Bright's disease deafness is sometimes noticed. Dieulafoy has drawn attention to the deafness of nephritis. In all these cases the increase of vascular tension explains the local hyperæmia found in the small arteries both of the tympanum and retina. I have treated several patients for "noises in the head," a "sense of fulness," and "throbbing," who have been sufferers from the granular form of Bright's kidney. The urine in these cases is of very low specific gravity, and pain in the head is sometimes an attendant symptom.

The great importance of recognising these remote evidences in the retinal and auditory circulations of hyperæmia and increase in vascular tension is evident. It may lead to the anticipation of convulsions in pregnancy, and should at all times suggest an examination of the urine and retina. The visible changes in the retinal circulation, under such conditions of the blood as those present in Bright's disease, and during the albuminuria of pregnancy, would suggest analogous alterations in the structures

¹ The macroscopic examination was made by the help of chromic acid mixed with saltpetre (Waldeyer-Goldstein method).

and vascular supply of the tympanum or labyrinth. These might be summed up as including localised hyperæmias, sclerotic changes causing thickening, contractions and adhesions, minute apoplexies and extravasations or inactions.

Ladreil de Lacharriere detected, in a case of nephritic deafness, hyperæmia and attendant rupture of the tympanum. Mr Downie (*Glasgow Medical Journal*, December 1885) draws attention to Dieulafoy's observations on this subject (*Gazette Hebdomadaire de Medicine et de Chirurgie*, January 1878).

MENSTRUAL DISTURBANCES.

It is well known that various ocular and auditory affections are the consequences of irregularities in the menstrual function. Amenorrhœa on the one hand frequently is attended by hyperæmic states of the retina and milder degrees of retinitis, or on the other, the anæmia which is its cause produces in the overworked nervous structures both retinal irritation and early tire of the accommodative apparatus of the eye. It is not uncommon to find troublesome spasmoid states of accommodation with low degrees of refractive aberration in such patients, most difficult to rectify. The auditory nervous and vascular structures may equally suffer, and analogous defects follow in the intrinsic muscular (accommodative) apparatus of the ear. Hence at first tinnitus, followed in time by some difficulty in differentiating sound and partial deafness.

It is more especially during the menopause that we find these auditory changes beginning. Frequent pregnancies, with the accompanying vascular and blood changes may predispose to these. The ear suffers from the same local and intermittent congestive attacks as other organs, while the attendant cerebral disturbances so frequent at this period of life give rise to auditory subjective noises quite apart from any local changes. On many occasions I have been consulted by patients at the change of life for auditory hallucinations, such as the sound of voices, musical illusions, hearing feet approaching, &c., in whom the hearing was perfect. Sometimes the menorrhagia or metrorrhagia which complicates the menopause, as in the case of loss of blood

from other causes, for example, in fibroid tumour of the uterus, induces tinnitus.

It is especially during the menopause that we have to guard against the increase of "progressive deafness," and, if consulted for its premonitory signs, we should attend carefully to the general circulation, the state of the naso-pharynx, and the ventilation of the aural passages and tympanic cavities, at the same time that we, so far as we can, control or modify the uterine flux.

Puerperal causes may lead to tinnitus and deafness. We cannot be astonished at this when we reflect on the changes in the blood and vascular system present during pregnancy, as well as the cardiac hypertrophy or other lesion occasionally attendant upon these hydramic states on the one hand, or hyperfibrinosis on the other, with or without albuminuria, and which predispose both to haemorrhage and puerperal septicæmic affections. Here, in the toxic state of the blood, and the varying degrees of vascular tension, or, possibly, effusions or haemorrhage, we have the source, not alone of the retinal, but the accompanying auditory affections ante and post-partum.

CARDIAC LESIONS.

Cardiac lesions are a frequent source of tinnitus and disturbance of tension. A tinnitus, which we cannot readily account for by the local physical signs, should always prompt us to examine the heart carefully, as in a mitral or aortic murmur we may find the solution of the mystery.

FEVERS.

The proportion of fever patients (I allude more particularly to typhus and typhoid) in whom any permanent aural lesion remains after the fever, is insignificant if we compare the number of those attacked with even severe fever with the cases of deafness arising therefrom. I only record eight cases out of those I have classified who attributed their deafness to any form of fever. I speak also from a large public dispensary experience, and eleven years of work in a fever hospital—in which we treated yearly an average of some five or six hundred cases of fever—and from a personal conduct of some 2500 cases of fever of different kinds. It is the rule

for the temporary deafness which accompanies a severe fever to pass off when the attack subsides and the patient is convalescent.

This statement does not apply to the aural disturbances which follow typical and malarial fevers. Here the remittent congestive attacks leave permanent lesions, and constantly incurable tinnitus or deafness.

GOUT.

Gout also has had amongst its other universal attributes the power of causing deafness commonly attributed to it. Gout furnishes one of those familiar explanations of anything and everything with a certain class of patient, and, where hard pressed, it is the forlorn hope that ignorance gladly falls back on, and which fashionable empiricism is ever ready to bring forward as a cause for most of the ills that flesh is heir to. No doubt it is a mischievous heirloom, and I have seen many instances of morbid changes in the ears of gouty patients, and in those members of gouty families who did not themselves suffer from gout. The influence of gout, however, as a cause of deafness, exostosis, and other morbid changes in the auditory apparatus is greatly exaggerated.

Gout may produce its effects at any age, and these are often most insidious, but those cases that I have seen were all over the age of thirty. I have occasionally noticed the coincidence of exostosis of the external meatus in gouty patients, and in those in whose family there has been a history of gout. Hinton drew attention to a peculiar "irritability of the meatus attended by slight serous or sticky discharge, with itching or pricking pain, the walls being somewhat swollen and having a tendency to purple in their redness," as a form of gouty affection. This I have many times seen.

Take such instances of gout as the three following cases:—

A gentleman consulted me for deafness in the right ear, the left being hopelessly deaf for many years. He could not hear the tuning-fork louder in either ear on closure. The watch was heard at one inch with the right ear, the click of the nail at two and a half feet. He never had discharge or pain, and never heard any noises. The external meatus was narrowed and

contracted from small exostoses, and the membrane was thickened and vascular. There was an occasional sense of fulness and throbbing. The sound with the otoscope was abnormally moist. He had consulted Mr Hinton in 1869, and I had several communications with him about this case, in which he took a great interest. Both ears were much in the same condition,—the appearance before referred to, viz., a moisture and packing up with epithelium. Mr Hinton regarded the case as of a gouty nature. The patient was always relieved by iodide of potassium and gouty remedies, the employment of the douche, and injections of iodide of potassium into the middle ear, with careful attention to the external meatus. The last time I saw him he was considerably and permanently benefited.

A gentleman (age 60) consulted me for deafness arising from a condition much the same as that described in the last case. The exostoses were perhaps larger. He had become gradually deaf, and was worse in one ear than the other. He had never suffered from gout himself; his grandfather and father both died from the effects of gout. Other members of his family are greatly afflicted by the same malady. He was convinced that his condition proceeded from the same cause, and doubtless he was correct. Nothing improved him.

A gentleman (age 40) consulted me for extreme deafness in both ears. There was a gouty history, and he was of a gouty family. He always lived well, and indulged pretty freely in alcohol. The meatus of one ear was almost completely occluded with an exostosis, and there was a similar condition, though less in degree, of the other. Under treatment directed to reducing the congested condition of the meatus by frequent cleansing with astringent injections, and attention to the cavity of the tympanum, with constitutional remedies, he improved considerably before he passed from under my care.

CLIMATE.

Tinnitus and deafness, with catarrhal changes, are occasionally induced by a *residence in India*, and elsewhere in the tropics. These are not favourable cases to treat. The tinnitus is particularly

distressing and intractable. Frequently there is a catarrhal state of the membrane and tympanum, or an old closure of the Eustachian tube, accompanying it. There is generally evidence of auditory nerve impairment.

CONCUSSION AND GUN PRACTICE.

For those in the services who are obliged to be present at *gun practice*, the

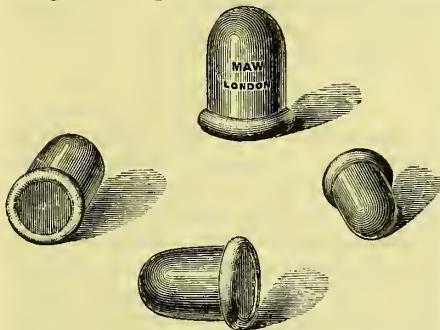


FIG. 1.—Ward Cousin's Sound Deadeners.

sound deadeners of Dr Ward Cousins will be found of use to prevent the effects of the concussion. I have had convenient little celluloid ear protectors made for the same purpose by Messrs Maw, Son, & Thompson. They serve as protectors for the meatus after syringing. I have them perforated so as not

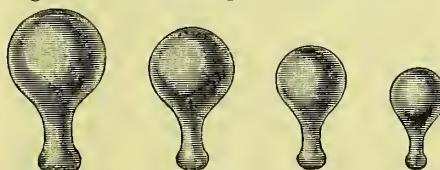


FIG. 2.—Author's Aural Protectors.

to encourage a vacuum in the meatus. They are made of different sizes, and are not objectionable to wear. They protect from cold and draught.

NASAL POLYPUS AND OZENA.

I would draw particular attention to the fact, lately commented on by Löwenberg, that out of the entire number of cases only two suffered from nasal polypus and four from ozæna.

QUININE.

Knapp's statement does not agree with the observations of Wecker and others, that after a disappearance of the deafness caused by quinine an ischaemia of

the retinal arteries was seen. I have given as much as fifteen and ten grain doses of quinine every third hour for remittent fever, and in various other conditions of hyperpyrexia, and continued its use for forty-eight hours and longer in these doses without the least permanent result following, though the symptoms of cerebral auditory disturbance, such as deafness and buzzing, were present during its administration.

That congestion of the membrana tympani (Kirchner and H. N. Spencer) occurs from the use of quinine has been proved, but the effect is temporary, and I have never known any permanent aural morbid conditions (save in that exceptional case quoted) which could be ascribed to the use of quinine even in those who had taken it in large doses for intermittent fevers in the tropics, or those to whom I have myself given it for antipyretic purposes.

Many years since (1867), while making some experiments as to the quantity of quinine excreted by the kidney, in which I was assisted by the late Professor Blyth, I gave a healthy man, a pensioner, thirty grains of quinia (the alkaloid) for the purpose of estimating the total amount of quinia excreted by the kidneys for twenty-four hours subsequently. The man suffered for a considerable time from tinnitus and partial deafness, this continuing for nearly twelve months, and gradually becoming less. He died eventually several years later from the effects of alcohol. The tinnitus and deafness never completely deserted him.

I am aware of a case in which the reeling and staggering gait produced by quinine, simulating those symptoms present in labyrinthine vertigo, has been mistaken for drunkenness, with most unpleasant consequences to the sufferer. It is especially in cases of anæmic tinnitus that I have found quinine of service. In cases in which tinnitus follows acute diseases, and in various debilitating conditions, quinine given in small doses at frequent intervals, especially when combined with digitalis, will often afford relief. As insisted on by Burnett¹ the cases in which any permanent physical results are found after the use of quinine, have generally other

Burnett, *Diseases of the Ear*, p. 569, 2nd ed.

causes operating, quite sufficient to account for the tinnitus or deafness independently of the medicine. Turnbull also says:—"We are prepared to state that we have never seen or known of a case of ear disease that was developed from quinine, either in large or small doses, and all the cases that have been reported as such had, prior to the use of the quinine, some form of disease which may have been temporarily augmented by the stimulation of the quinine as antiperiodic or tonic." I certainly have never known it to produce myringitis or tympanitis in children. If ever trouble arose during its administration the aural complications could be more truthfully ascribed to the catarrhal or general septic condition than to the quinine.

Still both Weber-Liel and Politzer incline to regard quinine as a cause of permanent deafness—though the former is such a strong advocate for its use in all stages of malarial otitis, both as a preventative and curative agent. Politzer says:—"It is necessary only to mention the well-known effects of quinine, salicylic acid, morphine and chloroform, which exercise a temporary, but often also a lasting influence on the functions of the auditory nerve." Even in the case above quoted, in which permanent mischief appeared to follow the large dose of the alkaloid quinine, the man was occasionally an inebriate, while there was a history of previous hardness of hearing. This undoubtedly the quinine permanently accentuated.

As Dr Lauder Brunton remarks, the hallucinations of mania, the prodromata of the epileptic fit are produced by the irritation of the hearing centre, so the tinnitus of quinine intoxication may be due to this toxic irritation of the same centre, independently of any local auditory phenomena that follow its use. That the tinnitus is produced rather by hyperæmic than anæmic conditions in the tympanum and labyrinth, is rendered more probable by the action of such drugs as hydrobromic acid and ergot in relieving it.

ANÆSTHETICS AND MORPHIA.

With regard to anæsthetics, I can call to recollection, with a rather unusually large experience of the administration of a variety of anæsthetics, not a

single instance in which deafness or permanent tinnitus followed their administration. I might say the same of morphine. I happen to know at the present moment two individuals who have on their arms and on parts of their legs hardly an available spot left for the insertion of the hypodermic syringe, from the state of skin brought about by constant injections, that have produced morphine craving—in neither instance is there tinnitus, and the hearing is normally acute.

OCCUPATIONS.

That certain occupations predispose to deafness in a variety of ways is the experience of all aurists. For example, Turnbull¹ has specially studied the effects of their calling on the hearing power in *locomotive and other engineers, firemen, and conductors*. From the shrill noises of the engines, the rapid passage on the exposed locomotive through the cold air in all vicissitudes of weather, the constant exposure, and oftentimes loss of sleep and want of rest, such employees are liable to deafness. That such deafness may be dangerous to passengers, if it prevents the engine-drivers or conductors hearing signals, the approach of other locomotives, or loud voices, is obvious. It may be more so even than colour-blindness. The watch, as Turnbull shows, is not the only test which should be tried for these persons. It is better to test them with different sounds and various tones, the voice in conversation, gongs, bells, &c. Railway travelling, especially at night, certainly predisposes to deafness.

I have noted several cases in which *incessant railway journeying* caused, or at least induced, a temporary tinnitus. This occurred to myself. I believe it to be associated with the vibration and noise of the train, the want of proper rest, and the imperfect sleep. I have an idea that medical men who pass a large proportion of their time in broughams must suffer in hearing more or less.

All such predisposing causes will operate in degree, according to the collateral influences present, as, for example, other abnormal conditions of the organs of hearing or general morbid states, or the existence of hereditary deafness.

¹ *Jour. Amer. Med. Assoc.*, Nov. 29, 1884.

That railway travelling does materially affect the auditory mechanism at the time is proved by the well-known fact that certain deaf persons hear well in a railway carriage, while others hear worse. To this I shall again refer. The vibratory movements, noise, and accompanying fatigue must imperceptibly react on those whose hearing is seemingly perfect.

Military life, especially in the British army, in which service in different parts of the world is nearly always demanded of the troops, is a not infrequent exciting cause of deafness. Residence in the various stations in India, bringing in its train intermittent fever, and rendering the person liable to a recurrence of attacks on return to England, and the effects of such campaigns as those our troops were engaged in at Abyssinia, the Zulu war, the Afghan, Egyptian, and Soudan expeditions, all necessitating prolonged exposure and fatigue under extremes of temperature, frequently cause throat and ear affections. Some of these are of a malarial, others of a simple catarrhal nature. Gunnery practice, likewise, may, through the effects of concussion, predispose to deafness.

To *prolonged Night-Nursing* I have found several patients attribute the beginning of their deafness. This is not so much in the case of professional nurses as in the instance of friends, when mental anxiety operates as much as the want of rest to enfeeble and enervate, the more so if grief or shock are added at the termination of a long illness. It is under such circumstances that we find enervated states of the tubal muscles, and presumably of the intrinsic muscular apparatus of the ear, producing progressive deafness; and it is here that complete relaxation, bracing air, and tonic treatment and regimen are so valuable in preventing tinnitus and deafness.

Various other occupations and trades may directly or indirectly lead to inflammatory affections of the ear, either, through auto-infection, as in the case of rag-sorters, or as the result of constant exposure to vicissitudes of weather or extremes of climate, as in those instances already mentioned.

In the following chapter I shall more fully discuss malarial and zymotic influences, and the results which ensue from the want of cleanliness generally.

SYRINGING.

Perhaps more harm is done to the ear by useless or forcible syringing, and the continuous and mischievous dropping of oil into the meatus, than by any other practices. We may state as a general rule in aural therapeutics, that save in the removal of foreign bodies and ceruminous plugs from the meatus, forcible syringing is injurious to the ear. I have already referred to the former of these contingencies. Cerumen is generally removable at the first visit of a patient. Sometimes those adherent casts of the external meatus which come away with imprints of its walls and of the outer surface of the drum-head do not yield without the assistance of the forceps or aural probe, though previous softening of the hardened secretion with some soda or potash solution will only delay the eviction of the mass for some twenty-four hours, if we decide not to hurry. Never to syringe on an exposed drum-head, and always to inspect the tympanum from time to time with the speculum when we are syringing an ear for the removal of cerumen and epithelium, are essential rules to observe. We should never entrust forcible syringing to the hands of friends and unskilled persons. Douching an ear is quite a different thing, and answers for many purposes of medication; it is easily carried out with an ordinary syphon tube (as that used for the nose) with an aural piece attached.

In the instance of children especially, syringing must be conducted with care and gentleness. It may be taken as a fact that three-fourths of the syringing carried out by parents, friends or nurses for children is absolutely useless, if they are not taught how to syringe the ear.

The outer portion of the meatus is washed daily, and the hollow of the passage is often filled with plugs of inspissated epithelium and pus, which collect on the tympanum, and are not reached by the stream (see chapter on Diseases of the External Meatus). Quite recently a mother indignantly repudiated my hint that the ear of her child was not properly cleansed, as the water came quite clear before she finished syringing. I satisfied her that it was not so by detaching a large mass or cake of pus, with floating particles of epithelium.

We must be careful not to overlook the temperature of the water used in syringing an ear. I have known negligent syringing with cold water cause sudden faintness in the patient and a great shock

to friends. This can always be avoided by using a metal syringe, and accustoming the hand on the cylinder to act as a gauge of the temperature, before injecting the water into the meatus.

CHAPTER IV.

ETIOLOGICAL—*continued.*

UNCLEANLINESS, RESULTS OF—CAUSES OF IN THE MEATUS—POLYPI—COTTON-WOOL—MICROCOCCI—WEBER-LIEL ON OTITIS INTERMITTENS—MALARIA—SEASON OF YEAR—FURUNCULUS AND INFECTIOUS EPIDEMIC INFLUENCES—CAUSES OF THE PRESENCE OF BACTERIA IN THE EXTERNAL MEATUS.

UNCLEANLINESS.

COLLECTIONS of cerumen, epithelium, pus, or the fungus aspergillus, are constantly present in the external meatus, and on inquiry and by examination we find that, owing to neglect, apathy, or ignorance of the consequences which follow from their presence, these tenants have been left either undisturbed or only partially removed for weeks or months, until frequently not only is serious inflammation and suppuration the result, but putrid products have been formed which occasionally imperil life as well as hearing.

Many morbid conditions both of the external and middle ear, may and do arise from neglect of the first of all cardinal principles in aural therapeutics, namely, cleanliness in the widest sense of the word. It may appear so obvious that neglect of cleanliness is the cause of a number of serious and commonly occurring diseases of the ear, that it seems absurd for any otologist to dwell on it.

My experience does not prove it to be so. Again and again have I seen neglect of this simple fact and ignorance of the true consequences of uncleanliness imperil not only the organ of hearing, but in several cases life itself has been the forfeit paid for this apathy or indifference. Let us take, without entering into details, some examples of the force of this assertion. How frequently are children brought to the surgeon with the external ear-passage full of purulent matter, which he knows to contain débris of pus, epithelial elements, slimy mucus, bacteria, perhaps blood, all mingled to form a combination of septic elements, which

find their way into the tympanum, and through its walls to the membranes of the brain, or into the mastoid cells, and which, pouring out of the ear, we are frequently told, "wets the pillow" of the little patient at night. How often, as a consequence, do we not find mastoid abscess with necrosis of the process, polypoid excrescences in the meatus bathed in and concealed by pus, perforation of the drum covering, with destruction of the ossicles, chronic suppurative and catarrhal conditions of the middle ear, cerebellar abscess, and possibly phlebitis. In adults, and especially in young persons of both sexes about the period of puberty, how frequently do we see the same results of neglected discharge in large perforations of the tympanum, ossicular destruction, exposed tympanic cavities, vascular polypi in the tympanum, foul and putrid accumulations in the meatus, the stench from which is found to be intolerable if the surgeon only chooses to test it by collecting a little of the matter on a piece of cotton-wool.

It is only on washing out the superficial matter, and then by passing the wool-armed aural probe deeply into the meatus or into the tympanum, that we find how foul is the discharge that lines the folds and crevices of the mucous membrane of the meatus and the cavity of the tympanum. If any one who has been in the habit of satisfying his conscience by simple syringing with water or some mild "antiseptic" lotion would convince himself of the mental delusion this imperfect idea of cleanliness has imposed, let him, when he has washed out the meatus until fluid comes "perfectly clear," the next time he gets such a case, just arm the

aural probe (see chapters on Diagnosis and General Therapeutics) with some absorbent wool and carry it well into the tympanum, and on withdrawing it I guarantee his olfactory sense will satisfy him of his mistake.

In chronic suppurative conditions of the middle ear I press urgently the value of close personal attention on the part of the surgeon. I do so the more anxiously in a work intended for the general surgeon, inasmuch as it must fall to his lot to treat many cases of chronic ear discharge accompanied by perforation and middle-ear accumulations or morbid growths. These are of every-day occurrence in general practice, and the first essential of safety for the patient, as it is for success on the part of the surgeon, is cleanliness. The mere syringing of an ear is not sufficient. The meatus should be thoroughly cleaned out, and the canal and tympanum dried with absorbent wool rolled on the aural probe.

I believe the advice given by Dr Charles Turnbull to be most necessary when he says:—"Teach the patients how to care for their ears. Show them how to syringe or cleanse the tympanum, and how to dry the parts thoroughly, and also how to inflate the ear by Valsalva's method." This knowledge on the part of patients becomes the more important when they cannot attend frequently for advice and treatment.

Those only, who go to the trouble of thoroughly cleansing an ear and exposed tympanic cavity, know how patient we have to be in securing absolute cleanliness and how troublesome the process often is.

It is no uncommon occurrence to have such patients come for relief from an incurable lesion, the result of slowly progressive and destructive processes of suppuration and putrefaction. The parents have feared "meddling" with the discharge, or they have been under the delusion that the child would "grow out of it," whatever that idea conveys. Unfortunately it is more commonly a "growing *into*" some serious lesion that is the consequence of toying with an ear with some little useless glass syringe, or one of those many forms of cheap ear douches or syringes with which people delude themselves they are cleansing an ear.

It is not an unusual result of polypus of the meatus, to find such a small growth

nearly filling the lumen of the canal, at some distance from the orifice, concealed and embedded in pus, a good deal of which is always imprisoned behind the growth. The latter may have made its appearance clandestinely (there has been no blood and little pain), and as a matter of observation these polypi have often existed for a considerable time before their discovery by the surgeon. Meantime the patient has either not been "meddled with" or some playful syringing has at varying intervals of time been resorted to. On three occasions it has fallen to my lot to see in adult patients who died of cerebral symptoms old polypi filling the meatus, with accompanying discharge. Nothing had been done. On each occasion it was rather the patient's fault than the surgeon's, for they had refused to permit any interference. And this fact I am aware, from too sad an experience, is a vital matter to insist on, namely, that the risk to life from cerebral complications is great in all persons who carry about with them these foci of suppuration and putrefaction, the precursors of either cerebral inflammation or septicæmia.

I have known two persons, both valuable lives, otherwise in perfect health, suddenly struck down with symptoms of cerebral inflammation directly due to an old-standing and neglected otitis media. Blocked-up discharge, inspissated masses of mucus with pus, may collect behind some dried and hardened wall of either epithelium, pus, or cerumen. The patient fancies the discharge has ceased. This temporary lull lasts for some time, when he is suddenly attacked with violent pain in the ear, perhaps vomiting sets in, and then all the symptoms of acute cerebral inflammation, perchance abscess, follow.

There is no safety to the patient while there exists a chronic discharge from the ear. It is the symptom of some morbid condition, and itself may be the source of diseased states, leading directly to death. Unfortunately, many treat the symptom (*i.e.*, the discharge) and overlook the pathological condition which has produced it, and are satisfied if they control an "*otorrhœa*," unmindful of the causes on which its presence depends.

To come to simpler examples. We may take first the dirty and harmful

practice of wearing pellets of cotton-wool in the ear. It is a matter of frequent occurrence to any one in large ear practice to withdraw from the meatus one, two, or sometimes three of these foul bacterial incubators and nests for decomposing pus. Sometimes their presence is forgotten, and a small pellet slips into the bottom of the meatus to lie over and occlude the perforated tympanum, or if not perforated, to carry putrescent elements to the *membrana tympani*, with which it is kept in constant contact for weeks or months. Other pieces are placed in the ear, which cover the imprisoned plug, or perhaps cerumen collects, becomes hardened, and completely obliterates from view and recollection the wool, which is not thought of until the patient comes to have "wax removed" (see chapter on External Meatus and Cerumen).

Persons who are annoyed with accumulations of cerumen have the tendency to place *wool in the meatus*, and frequently forget its presence, another layer of cerumen forms over the wool, and I have at times removed from this cause as many as three impactions of wax and two of wool from the auditory canal. In many of such cases it is very difficult without sufficient syringing and the aid of the lever crocodile forceps to remove these mixtures of hardened secretion and wool. Also, as in old ceruminous concretions in the meatus, the dead epithelium adheres as a coating to the wax plug, and forms a sort of cast of the canal adhering to its walls. If portions of this dead cuticle, which has occasionally mingled with it foetid masses of fungus (*aspergillus*) and mucus, are left behind after the removal of the wax, which from their adherent nature they are specially apt to be, they form the nidus for future infection and catarrhal inflammation. Such scales of epithelium are peculiarly tenacious, and, lying close against the wall of the meatus, or even on the surface of the membrane, they are liable to escape detection. Sometimes, as I have said, such epithelial linings come away in the form of perfect moulds of the meatus. It is these portions of epithelium that, mixing with the other contents of the meatus, generate fungi, and in the further degeneration of these epithelial masses form purulent deposits, the decom-

position of which creates septic matter and putrescent débris which may invade the tympanum, causing suppurative catarrh of its cavity. Frequently syringing will not get these epithelial casts or particles away. The edge of the layer has to be raised or detached with the aural probe, or with what will be found more convenient, a miniature flat vulcanite spatula or spoon, when the mass or particles can be brought away with the lever or sliding crocodile forceps.

Another source of epithelial accumulation in the external meatus is the common *eczema of the auricle*, which is also occasionally attended by either an accumulation of cerumen or perhaps some otorrhoeal discharge from the external ear. The hairs in the meatus in other cases collect the particles of cuticle, and these clinging to its other contents are retained, carrying the disease to the deeper parts of the canal. In children especially the retained epithelial débris may give rise to otitis externa, and this in its turn may attack the tympanum.

Recurrent furunculus and abscess are apt to be forgotten as soon as the pain and the temporary discharge have ceased. But frequently these inflammatory swellings, due constantly in their recurrence to bacterial infection, have imprisoned masses of micro-bacteria and epithelial or mucopurulent débris, which are in contact with the membrane or lie in the meatus. Their very recurrence is due to auto-infection and fresh accumulation of infecting germs.

We here learn the lesson of the value of sustained douching and the use of disinfectants after we have evacuated the pus of a furuncle or when it has spontaneously opened. So exostoses will imprison mucus, epithelium, or cerumen. Hence the importance of preserving the patency of the passage when those growths are present.

BACTERIA AND ZYMIC INFLUENCES.

As playing an important part in the etiology of all aural and naso-pharyngeal affections, we must not omit to consider the part taken by *bacteria* in the causation of acute and chronic diseases of the ear and naso-pharynx.

We may briefly epitomise what is known of the matter. To Löwenberg,

Weber-Liel, Denucé, Fraenkel we are more especially indebted for our application of the work of Pasteur to aural therapeutics.

OTITIS INTERMITTENS.

As far back as 1871, Weber-Liel gave the name "otitis intermittens" to those recurrent attacks of middle-ear inflammation which he attributed to the influence of malaria. At first, it may be, there is nothing felt save a fulness in the ear, giddiness, restlessness at night, and perspirations. These symptoms are followed the next evening by a rigor, and pain in the ear, accompanied by violent tinnitus and deafness. This may go on to perforation of the drum-head. These symptoms abate, leaving only a slight deafness and tinnitus. Pressure on the tragus does not cause pain. These rhythmical attacks succeed each other with more or less severity. One ear generally suffers most, but the other is not altogether free. Such attacks may assume the quotidian or tertian type, and recur occasionally for months. The cells of the mastoid may be attacked, and exudations take place into them. Despite of treatment, recurrent attacks of pain at night follow each other, to be relieved only by large doses of quinine. Dr Weber-Liel says that in such cases he has found the spleen tender and enlarged. This tendency to intermittent aural attacks is not as a rule met for the first time in a healthy ear, but follows on some chronic condition that has preceded it. Abscesses in the external meatus (furunculus) often assume this intermittent character, and yield equally to quinine. Malarial influences in unhealthy dwellings or surroundings will often be found to be the true exciting cause of such aural affections. Change of air is the cure for such cases, quinine being administered in large doses at the same time.

The accompanying neuralgic pain is distributed over all the branches of the trigeminus, with extension into neighbouring nerve districts. The vasomotor disturbance is shown in the fulness of the vessels, and the catarrhal condition of the middle ear, which (with the consequent exudations) is the result of the paralytic dilatation of the vessels of the tympanum and internal ear.

These intermittent paroxysms are frequently associated with rhinitis or pha-

ryngeal catarrh and attendant coryza. I have had several patients under my observation from time to time with attacks of intermittent neuralgia of the ear, with slight accompanying deafness, in which quinine in large doses alone proved of any service. I have seen many cases of aural catarrh, furunculus in the meatus, severe neuralgia, with accompanying throat catarrh, that I have no doubt owed their origin to defective hygienic surroundings.

Dr Cassels had, in 1878,¹ drawn attention to the influence of foul air emanating from defectively constructed sewers, foul drains, &c., in producing ear disease. Three members of his own family were attacked with severe otitis media. He performed paracentesis on all three, evacuating a quantity of pent-up serous fluid from the tympanum with marked benefit and permanent relief. Another child was subsequently attacked. In her case, by repeated paracentesis, "large masses of tough jelly-like mucus were removed." On close examination Dr Cassells found that "there was an escape of sewer gas from two of the closets into the house." He quotes several other instances of recurrent inflammation and deafness occurring in connection with defective drainage and sewage. Complete relief followed upon change of air.

Associated with these malarial influences Löwenberg also noticed severe neuralgias of the ear and the parts supplied by the trigeminus. Accompanying these attacks there were occasionally furuncular abscesses in the meatus, at times leading to mastoiditis. A sense of fulness in the ear and tinnitus attended those malarial inflammations and neuralgias. The fact that such inflammations partook of an epidemic character, and occurred more frequently in houses in

¹ With reference to this subject, see a series of interesting papers by Dr Löwenberg in *Le Progrès Medical*, July, August, Sept., 1881, *Knapp's Journal* and the *American Journal of Otology*, 1879; also "Ueber fragmentäre, larvarti Formen des Wechselfiebers im Gebiete des Gehörorgans Malariae neuralgias im Gebiete des Tregeminus," 1878, and various papers from time to time by Weber-Liel in *Monatschrift für Ohrenheilkunde*, No. 11, 1871, *German Clinical Studies*, No. 5, 1874, *German Practice of Medicine*, Nos. 15, 16, 1877; Cassell's paper in *Edinburgh Med. Journal*, April 1878; *Archives of Otology*, vol. x. No. 3, Sept. 1881 (Löwenberg); *Transactions of the International and Otological Congress*, 1884 (Löwenberg).

which there were insanitary surroundings, as also that they were more prevalent at the spring time of the year, did not escape the attention of Dr Weber-Liel, and later on Paterson Cassells drew attention to a like coincidence. Holz and Orne Green noticed the same epidemic influences. Since then Weber-Liel has several times recurred to this interesting etiological fact in regard to middle-ear affections. In 1880 Dr Löwenberg noticed in Paris an epidemic of furuncles in the auditory meatus, but previously to this he had drawn attention to the prevalence of furuncles in the spring, and the epidemic nature of these attacks. The association between certain trades (rag manufactories and tanneries) or occupations in which decomposing substances were brought in contact with the ear, was noticed by Denucé.

The relation between catarrh of the middle ear and the seasons has been frequently observed, the spring and autumn being the two most favourable periods for their development.

Miquel and Rindfleisch have shown that rains favour the development of the parasitical fungi, but are destructive to the growth of schizophytes.

The same etiological fact is seen in the connection between the seasons and such diseases as pneumonia, typhus, and enteric fevers. More especially are the two former diseases prevalent in early spring, and the latter disease in autumn.

Löwenberg, by a series of investigations, discovered micrococci and bacteria in the discharges of furunculus meati and in those of suppurative otitis. The recurrent nature of the former affection is thus, through its infectious nature, explained. The identical microbe reappeared always after its inoculation or cultivation. This likewise constitutes an important distinction between ordinary abscess of the meatus, in which no microbes are present, and furunculus. I am convinced of the truth of Löwenberg's view, that there is a distinct etiological difference between ordinary abscess and the recurrent furunculus of the auditory meatus,¹ so frequently do we see this latter affection associated with states in which we can readily conceive the multiplication of microspores to occur, and where any contagious elements will find

a fertile soil. It is in the presence and persistence of such fertilising organisms both in discharges and neglected secretions that we must seek for an explanation of the persistent nature of many chronic aural troubles and the intractable character of the discharges that accompany these.

The power of autogenous infection present in the furunculus, and the chances of the multiplication of the microspores or their penetration into the general circulation either through secondary involvement of the walls of the vessels or by direct penetration (Klebs), explain the occasional occurrence of putrid fever and the formation of thrombus and remote abscesses after furunculus. In referring to the diagnosis of furunculus from abscess Löwenberg insists that inspection alone will not enable us to come to any conclusion. He would rather rely on the multiplication of the microbe in an aqueous solution of Liebig's extract of meat or ordinary beef-tea.

He commences treatment by cutting the furuncle if it has not broken itself; he uses, though we think this unnecessary, an anaesthetic, in order to freely follow the duct of the follicle. Immediately after he applies an alcoholic solution of boracic acid or fine powder (M. Berzold). I prefer the alcoholic solution, and have constantly, in cases of violent furunculous inflammation, applied this treatment with marked success.

These facts and many other considerations force on us the value of antiseptic treatment in the management of inflammatory diseases of the external and middle ear, so frequently and strongly insisted on elsewhere throughout this work, and not in affections of the ear alone, but also in those of the naso-pharynx and throat. Pasteur has shown the dependence of boils on the presence of a particular microbe, thus explaining the unpleasant facility of auto-inoculation with discharges from boils which we are all familiar with. He injected the liquid containing the germs found in aural furunculus under the skin of the rabbit, and obtained as a result abscesses with identical organisms. The consecutive abscesses were of a modified type, and were more readily cured. Löwenberg cultivated the microbes in beef-tea, and he looks on their presence as characteristic of furunculus,

¹ Paper by author, "Specialist," Nov. 1, 1881.

and furnishing the test as between this form of inflammation and ordinary abscess. In the latter disease he remarks with Weber-Liel that the meatus is not entirely and equally swollen, rather have we isolated sensitive spots, which are prominent, and which rapidly become globular. He believes that there is a relation between the enfeeblement of the constitution during winter and the subsequent change in the seasons, the accompanying heavy rains, the infection of drinking and washing water and the occurrence of furunculus in spring.

The prevalence of heavy rain acting on the soil causes the absorption of organic material, which in its turn vitiates the drinking water, and that used for washing purposes. The presence of furunculi in diabetic patients he considers due to lowered vitality, diminished body temperature, the imbibition of large quantities of water, the retention of sugar in the blood, the abstraction of water from the tissues—especially the skin—and the sugar itself, which is favourable to microbe formation. The skin is unhealthy and is ready and prone to receive the infection, and this also accounts for the readiness with which auto-inoculation occurs in such patients.

The external auditory meatus, as he remarks, “amongst all the cavities of the body is the most suitable camping-ground for those micro-organisms, which are incessantly blown to and fro by the constant currents of air about us.”

In it, with its partially-obstructed orifice, moisture, warmth, and sebaceous contents, we have all the necessary conditions which induce fermentative processes. In subsequent investigations Löwenberg showed that there exists a morphological difference between the microphytes found in furunculi previous to their opening and those contained in the pus of furunculi exposed to the atmosphere, and in chronic otorrhœal discharges. The greater the age of the imprisoned discharge and the more offensive, the larger the number of micrococci found in the pus. Neglect and foetor of discharge were attended by the presence of swarms of bacteria, which emollient applications and cataplasms always acted as nurseries for.

The fact cannot be too strongly insisted on that linseed poultices not only cause

the multiplication of micro-organisms but may act as carriers of them, having been detected in the meal during preparation (Neprew). With the pus, epithelium, and products of inflammation they convert, as Löwenberg well remarks, the auditory meatus into a hothouse for the culture of bacteria. In foetid otorrhœal pus, schizomycetes, spherical and rod bacteria, spores and zoögloea, have been found. And the facilities for transmission and migration which exist in the middle ear, both with the internal ear, the petrous portion of the temporal bone, and the mastoid process, explain the presence of these organisms, in foetid collections of pus and débris in these parts. Löwenberg thinks that those cases of cerebral abscess which occur without any breach of continuity in the petrous portion of the temporal bone are due to the penetration of the migrating corpuscles by the micrococci. He has demonstrated the existence of a special coccus in ozæna, and Fraenkel, prior to this, had shown their presence in this disease. The nasal passages form the most convenient hiding places for any micro-organisms which may be in the atmosphere. Our entire clinical and pathological knowledge of affections of the external and middle ear tends to establish closely the occasional zymotic character of such diseases.

The “miasmatic influences” of Weber-Liel, defective sewage as a cause of contagious middle-ear diseases, the epidemic nature of external-ear inflammations, the relief given by quinine—are all facts which clearly point to the septic and pythogenic character of many aural affections; while in the diseases diphtheria and scarlatina we find the ear frequently suffering from the general septic conditions as well as from the extension locally of the inflammatory process to the tympanum. We shall have more to say to the application of this knowledge in the therapeutics of middle-ear diseases. Meantime we refer to it rather to show how seasons of year, temperature, atmospheric moisture, rainfall, malaria, have to be considered in the etiology of naso-pharyngeal and ear inflammations, as also the value of the antiseptic treatment and attention to general hygienic surroundings in disorders of the ear.

CHAPTER V.

ANATOMICAL AND PHYSIOLOGICAL.

GENERAL REMARKS ON THE ANATOMICAL AND PHYSIOLOGICAL FACTS CONNECTED WITH THE STRUCTURE AND FUNCTIONS OF THE EXTERNAL, MIDDLE, AND INTERNAL EAR AFFECTING THEIR TREATMENT IN DISEASE—THE EXTERNAL AUDITORY MEATUS—THE MEMBRANA TYMPANI—THE TYMPANIC CAVITY—THE EUSTACHIAN TUBE—THE MASTOID PROCESS AND CELLS—THE LABYRINTH.

WITHOUT departing from the determination already expressed not to enter in detail into the anatomy and physiology

find. The latter, also, is more or less covered with minute hairs, which serve to catch any dust which penetrates, without perceptibly deadening the sound."

The auditory canal, the first part of which ($\frac{1}{3}$) is composed of cartilage, and the inner part ($\frac{2}{3}$) of bone, is not a straight tube of equal width. It is contracted at the opening, which contraction turns upwards and inwards; then it expands and terminates at the tympanic membrane, the surface of which is placed at an oblique angle to it, and is directed inwards and downwards (Bernstein).

Tröltzsch drew attention to the slow development of the osseous meatus in the child, stating that, "often until the sixth year a gap is left in the ossification, which only diminishes very gradually, and, from its sharp, irregular edges, might very easily be considered morbid and the result of caries, and, at any rate, might facilitate the spread of inflammatory processes to the maxillary articulation and the parotid gland;" also, that "in very young children the inner half of the exceedingly narrow meatus has scarcely any open calibre, since the membrane, which lies horizontally, is in contact in its whole extent with the membranous floor of the meatus, this contact being due in part to the fact that the epidermis covering the mem-

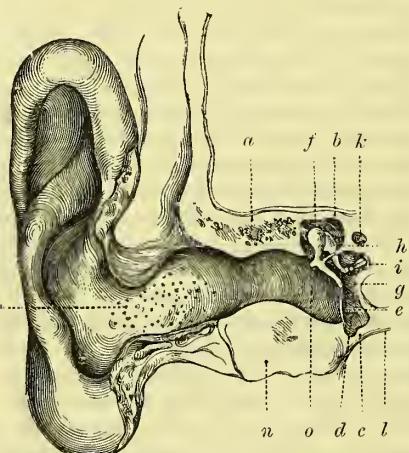


FIG. 3.—Vertical section of external meatus, membrana tympani, and tympanic cavity. *a*, Cellular spaces in the superior wall of the meatus connected with the middle ear; *b*, roof of the tympanic cavity; *c*, inferior wall; *d*, tympanic cavity; *e*, membrana tympani; *f*, head of the malleus; *g*, handle of the malleus; *h*, incus; *i*, stapes; *k*, Fallopian canal; *l*, fossa jugularis; *m*, apertures of glands in the external meatus; *n*, mastoid process. (Right ear.) (After Politzer.)

of the ear, the practitioner may be usefully reminded of the most important anatomical and physiological facts connected with the structure and function of the external, middle, and internal ear which affect the treatment of its various morbid conditions.

THE EXTERNAL EAR.

"Just as the eyelids," says Burnet, "prevent the entrance of the injurious substances into the eye, so the external ear prevents the entrance of dust and small particles, which might easily be blown through the air into the auditory canal, and also of insects, not by a closing movement, but in the human ear by means of its peculiarly coiled form, which makes the entrance difficult to

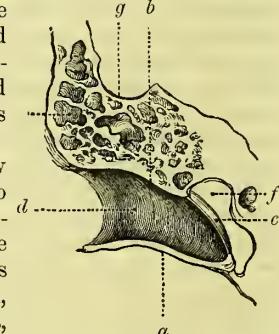


FIG. 4.—Horizontal section of the external meatus and tympanic cavity. *a*, Anterior wall of the meatus; *b*, posterior; *c*, cells of the mastoid process; *d*, meatus; *e*, membrana tympani; *f*, tympanic cavity; *g*, fossa sigmoidea. (Right ear.) (After Politzer.)

brane has at this time very considerable thickness." 1

The isthmus of the canal is its most contracted portion, this narrowing being caused by the greater convexity of the anterior and posterior walls at this part. It is situated from the anterior margin of the membrana tympani 7-8 mm. from

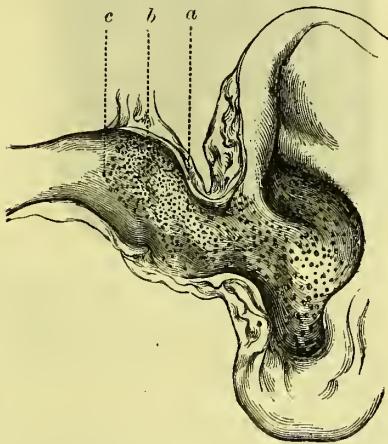


FIG. 5.—Posterior wall of the cartilaginous and osseous meatus. *a*, Orifices of glands on the cartilaginous portion; *b*, boundary between cartilaginous and osseous meatus; *c*, termination of the triangular space occupied by the orifices of the glands, which protrudes into the osseous meatus. (After Politzer.)

the posterior 1-2 m. (Politzer). In manipulation, cleansing, or syringing the meatus this must be remembered, as also in the removal of foreign bodies (see chapter on "Removal of Foreign Bodies").

It is well to emphasise the importance of always keeping in view the length of the meatus. This varies, as do the diameter and curves of the passage in different individuals. The average length is from 24-26 mm., the anterior and inferior walls being from 3-4 mm. longer than the posterior and inferior respectively.

The following, among other clinical and pathological facts explained by the anatomy of the external auditory meatus, are worthy of attention (see Politzer, *op. cit.*):—

The traversing of the cartilaginous portion by the fissures of Santorini, filled as they are by fibrous tissue, helps to straighten the meatus during examination of the membrana tympani, and

¹ Pollak has shown, however, that this is not so, and that there is no material difference in the inclination of the membrane in the infant and adult.

through these fissures pus may force its way as the result of parotitis. In children I have seen the error made, alluded to by Politzer, of a discharge thus find-

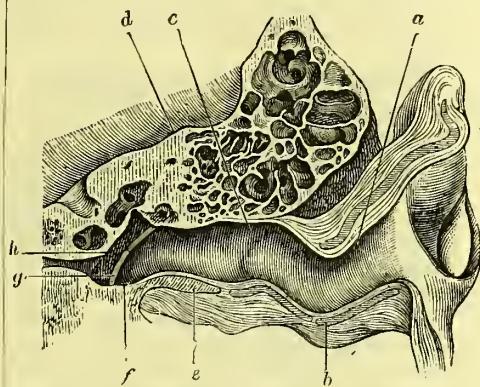


FIG. 6.—Horizontal section of the external meatus. *a*, Concha; *b*, tragus; *c*, place of attachment of the cartilaginous portion; *d*, mastoid process; *e*, anterior wall of the meatus; *f*, sin. meat. audit. extern.; *g*, membrana tympani; *h*, tympanic cavity. (After Politzer.)

ing its way (after the exanthemata) into the external meatus, being regarded as coming from the tympanum. Also the ready involvement of the parotid in affections of the meatus is explained.

The superior wall of the meatus (in the adult) appertains to the middle cranial cavity, and is covered by dura mater. Fatal meningitis, which follows caries of this wall, is thus accounted for, and the dangers of rude efforts at extraction of foreign bodies are explained; the concavity of the inferior wall close to the tympanum permits of the lodgment of small foreign bodies. The unequal length of the superior and inferior walls, as well as of the anterior and posterior, have to be taken into consideration in the examination of the membrana tympani. The motion of the meatus felt during a movement of this jaw, when we insert the finger into it, is due to the relation of the superior portion of the anterior wall to the posterior part of the glenoid cavity, and this wall, being separated occasionally from the cranial cavity only by a thin osseous lamella, the extension of the glenoid cavity outwards beyond the anterior wall of the osseous meatus, brings the posterior wall of the capsule of the joint into contact with both the osseous and cartilaginous meatus. The great pain occasionally complained of

by aural patients in movements of the jaw in deglutition is thus explained.

The relation of the posterior wall of the meatus to the mastoid cells shows how the extension of necrosis of these to the external meatus and *vice versa* occurs.

The fact that the glandular structure of the external meatus ceases at some distance from the membrana tympani, leaving the cutis in close union with the periosteum, explains the severe periosteal pain and thickening which ensue on inflammation of the dermoid layer of the meatus, and the occurrence of abscess or boil in the outer portion of the canal, while the papillæ described by Gerlack found in the cutis of the osseous portion are frequently the source of polypi. Nor must the extension of the osseous portions of the superior and posterior walls over the cartilaginous be forgotten, as it accounts for the occurrence of exostoses in these walls.

The large vascular supply of the meatus from the branches of the temporal and internal maxillary, and the free distribution of these vessels in the fibrous connective tissue, as also to the perichondrium explain the reason for the rapid increase in congestive states of the meatus, the throbbing pain and pulsation which is here so quickly complained of, while also the continuation of portion of the same vascular supply to the membrana tympani and the anastomoses with the tympanic vessels teaches us the therapeutical value of early leeching. A medical friend of mine, advanced in life, who suffered from a most distressing throbbing and fulness of the ear, attended by a loud tinnitus, was under my care for some years for another affection. He was in the habit of relieving the aural symptoms by the application of a few leeches behind the ear or inside the concha.

The various communications with the external jugular vein and the deeper tributaries of the cranial veins, and indirectly with the sinuses, remind us of the occasional occurrence of thrombosis following from septic conditions arising out of abscess of the meatus.

THE MIDDLE EAR.

The Membrana Tympani.—The practical points which it is requisite to keep in mind in making an examination are as

follows:—The healthy membrana tympani is nearly circular (9–10 mm., Tröltzsch), translucent and concave, with

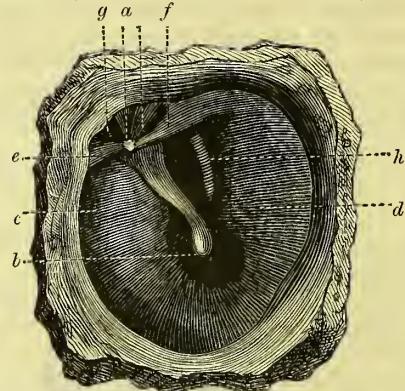


FIG. 7.—External surface of the left membrana tympani, several times enlarged. *a*, Short process of the malleus; *b*, umbo; *c*, anterior portion, and *d*, posterior portion of the membrana tympani; *e*, anterior fold; *f*, posterior fold of the membrane; *g*, Shrapnell's membrane; *h*, long process of incus seen through the membrana tympani. (After Politzer.)

a thickness between the handle and circumference of 0.10 mm. (Henle), and is fixed to the temporal bone at its circumference, and at its centre to the handle

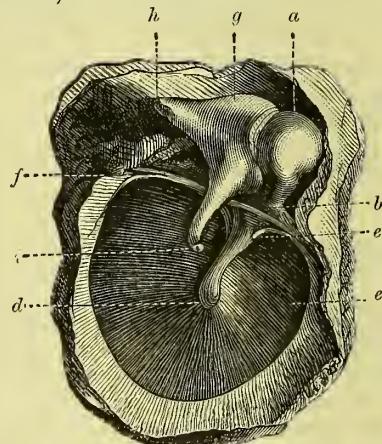


FIG. 8.—Internal surface of left membrana tympani, enlarged. *a*, Head of the malleus; *b*, neck of the malleus; *c*, tendon of the tensor tympani and anterior fold of the membrana tympani; *d*, inferior extremity of the handle of the malleus; *e*, anterior portion of the membrana tympani; *f*, posterior fold of the membrana tympani and the chorda tympani; *g*, incus; *h*, short process of the incus; *i*, long process. (After Politzer.)

of the malleus. It varies in colour from a “pearl,” or “neutral grey,” to a yellowish-white, or at times even an ivory white. It is placed obliquely, and forms, with the floor of the meatus, a very acute angle, with the roof a slightly

rounded obtuse angle of about 140°. Its anterior-inferior part is further removed from the external opening of the auditory canal than the posterior-superior part.

The manubrium is seen dividing the membrane into two parts or segments, the anterior or smaller, the posterior or larger. Its lower prominent end, of a yellowish colour, drawing the membrana tympani inwards, forms the depressed spot in the centre of the drum. The lower end of the manubrium itself is of diagnostic value, as changes in the colour, form, and degree of mobility, will point to alteration in position of the bone, thickness and rigidity of the membrana tympani, ankylosis of the ossicles. At the point where the manubrium terminates, we see the well-known cone

of light or triangular spot which gives to the membrane that beautiful and lustrous appearance when light is thrown on to it by the mirror. The lustrous epithelium of the membrana tympani, its funnel shape, and the peculiar inclination of the membrane, account both for the position and shape of the cone of light.

The pyramid has its base directed downwards, but its position and extent are variable, and it is by no means uncommon to find its usual shape altogether lost, or perhaps no cone of light in an ear in which the hearing power is perfectly normal. It thus serves as a delicate indication of the degree of mobility of the membrane as it is variously altered when the membrane is forcibly inflated by Valsalva's method. In a normal state this spot partially disappears on inflation, and the funnel-shaped depression underneath it is bulged outwards.

The short process of the malleus is

also of considerable importance in a diagnostic point of view, for it separates the anterior from the posterior pocket of the membrane, the posterior being over, the anterior under, the short process. These pockets are formed by the

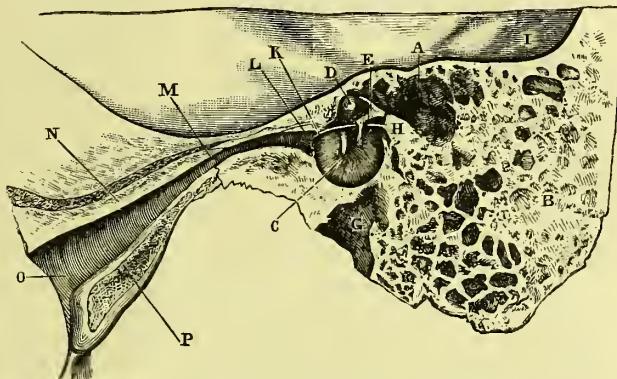


FIG. 9.—Section through the whole extent of the middle ear. *a*, Antrum mastoideum; *b*, mastoid cells; *c*, inner surface of tympanic membrane, at lower end of manubrium; *d*, head of malleus; *e*, body of incus; *g*, fossa for jugular vein; *h*, pyramidal partition of bone separating the cavity of the tympanum from the antrum mastoideum. Below the letter *h* a portion of the canal for the facial nerve is shown; *i*, dura mater; *k*, chorda tympani nerve; *l*, tympanic mouth of Eustachian tube; *m*, isthmus of the Eustachian tube; *n* and *p*, walls of cartilaginous part of Eustachian tube; *o*, pharyngeal mouth of Eustachian tube. (After Barr.)

ligamentous folds of mucous membrane or prolongations of the ligamentum mallei anterius. They are of clinical importance, as it is in them that the

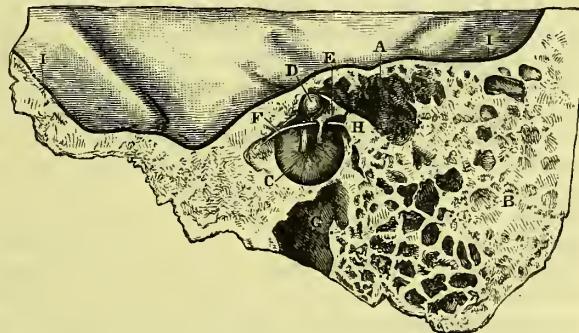


FIG. 10.—Inner aspect of the outer half of the temporal bone exposed by a vertical section made antero-posteriorly through the tympanum, antrum mastoideum, and other mastoid cells. *a*, antrum mastoideum; *b*, mastoid cells; *c*, inner surface of tympanic membrane; *d* and *e*, head of malleus and body of incus, forming the osseous partition dividing the upper tympanic space into two compartments—in the drawing the outer is concealed by these two bones; *f*, chorda tympani nerve; *g*, fossa for jugular vein; *h*, pyramidal partition of bone separating the cavity of the tympanum from the antrum mastoideum. Below the letter *h*, a portion of the canal for the facial nerve is shown; *i*, dura mater. (After Barr.)

secretion of mucus is retained (Hinton), and that we notice the bulgings of the membrane which we so frequently see when this retention occurs.

Above these folds of mucous membrane

at either side of the short process is Shrapnell's membrane, the most flaccid portion of the membrana tympani, a frequent situation for collections of pus, growths of small polypi, inflammatory attacks or perforations, and behind which we often have accumulations of mucus or other secretions which push forward the membrane at this spot. The membrane is united to the auditory canal by its tendinous ring. This latter structure gives origin to the fibres of the middle layer of the membrane, which pass to be inserted into the malleus with its cartilaginous groove. The membrane consists of three layers, an outer or dermic, a middle or fibrous, an internal or mucous, and the continuity of the dermic layer with that of the external meatus is to be remembered in the ready extension of inflammation of the meatus to the drum-head, and still further of equal moment is the direct continuation of the inner layer with the lining membrane of the tympanic cavity, and its intimate connection with the middle layer of the meatus.

It is well to remember the analogy existing between the membrana tympani of the ear and the iris of the eye, in the arrangement of the radiating and circular fibres, which have a relaxing and sphincter action, preserving thus a balance of power when the drum-head is in a state of rest, and which, according to Helmholtz, explains its peculiar concavo-convex shape. The close relation of the chorda tympani nerve to the membrane, defining, with the reflections of the mucous membrane covering it, the two pockets or pouches at the inner side of the upper portion of the drum-head, should be remembered.

The highly vascular nature of the membrane and the free distribution of nerves to this delicate structure, account for the rapidity of the inflammatory process in it, its ready injection with blood when irritated, and the great sensitiveness and pain that accompany all such inflammatory attacks.

Tympanic Cavity.—The following in tabular form are the most important anatomical points for the surgeon to keep before him in the pathology and treatment of affections of the tympanic cavity:—

(a) The distance of the membrane from the promontory at its umbilical

depression is about 2 mm. It is the part nearest the inner wall of the tympanum; here adhesions most commonly occur. The long process of the incus is distant from the membrane $1\frac{1}{2}$ –2 mm., and the capitulum of the stapes $2\frac{1}{2}$ –3 mm. (Politzer). If the membrane is very transparent these will be seen and exposed to view behind the handle of the malleus if the membrane be destroyed. This proximity of the membrane to these ossicula accounts for adhesions of the membrane to them, and the same fact has to be recollected in operations on this segment.

(b) The direct communication in the infant through the vascular supply between the tympanic cavity and the dura mater (in the vessels passing through the suture in the superior wall of the tympanum) accounts for the occurrence of meningitis in children in cases of tympanitis.

(c) The thinness of the osseous plate, often defective, which separates the tympanic and cranial cavities, makes the surgeon naturally apprehensive of extension of mischief to the brain in chronic suppurative conditions of the middle ear.

(d) The occasional occurrence of thrombosis and septicæmia in acute and chronic suppurative catarrh finds its explanation in the nearness of the jugular fossa to the inferior wall; while the closeness of the carotid canal to the anterior wall of the tympanic cavity accounts for the fatal haemorrhage, fortunately of rare occurrence, which may attend on suppurative otitis media.

(e) The various structures in the cavity of the tympanum in their relation to each other, the position of the ossicula, their articulations, the relative positions of the fenestra, and especially the relation of the stapes to the incus and to the fenestra ovalis, the intrinsic muscles, with the arterial and nerve supplies of the tympanum, all demand a careful study in connection with the many functional and organic disturbances of hearing which result from displacement of the ossicles, adhesions, ankyloses of the articulations, contraction of the muscles, or occlusion of the fenestra. I can here merely draw attention to a few of the alterations in the normal structures of the tympanum in their anatomical positions and relations.

1. Proliferation of connective tissue, accumulation of mucus, at times inspissated or hard, thickening of the mucous lining of the cavity leading to interference with the fenestra or fixation of the stapes against the oval foramen.

2. Alteration in the topographical relations of the ossicula to each other and to the tympanic walls, with rigidity, or ankyloses in the articulations—ankylosis of the malleus to the superior wall of the tympanum, ankylosis of the short process of the incus to the posterior wall of the tympanum, fixation of the stapes.

3. Ernervation, paresis, spasm, rigidity, atrophy of the intra-tympanic muscles, the tensor tympani, and stapedius (the supply of these muscles, the former from the motor division of the 5th nerve and the latter from the facial, being remembered).

4. In the chapter on tinnitus aurium reference is made to the consequences following on physiological and pathological changes in the vascular supplies of the tympanum, as also the bearing of the vascular and nerve communications between the middle ear and labyrinth on various functional and organic disturbances in the hearing (see *Labyrinth*), as for example in Ménière's disease and aural migraine.

THE EUSTACHIAN TUBE.

The Eustachian tube is about one inch and a half in length ("35 mm.; 24 mm. of which belong to the cartilaginous, 11 mm. to the osseous canal," Tröltzsch), the osseous portion in the temporal bone being three-quarters of an inch, and the cartilaginous portion one inch. The lumen of the osseous portion of the canal is about 2 mm. (Henlé). The width of the tympanic opening of the tube is 3 mm. In the child, while the tympanic orifice is comparatively large, the faecal orifice is small, while the tube itself is shorter and wider. These facts explain the ready closure of the tube in pharyngeal congestive or adenoid states in children, and the rapid improvement we often find on inflation with the air douche.

The tube is funnel-shaped, its narrowest part being at the junction of the osseous with the cartilaginous portion. It passes from the anterior wall of the tympanum downwards, forwards, and inwards, to terminate at the pharyngeal orifice, which projects as the opening of the trumpet, close behind the internal pterygoid plate, on a level with the inferior turbinate bone, at the back part of the inferior meatus of the nose. Two lips bound this orifice, one posterior, directed downwards, the other anterior, turned upwards. It measures (Tröltzsch) "9 mm. in height, 5 mm. in width." This faecal orifice (Toynbee) is nearly half an inch long. The pharyngeal end is the widest portion of the canal, and is composed both of cartilage and fibrous membrane. The mucous surfaces of the membrane which line this canal are in a state of apposition, the two patent points being the faecal orifice and the commencement of the osseous portion (Tröltzsch).

This arrangement converts the Eustachian tube into a form of valve, which in a state of rest is closed, and which opens and closes at each act of deglutition, in consequence of the action of the tensor and levator palati muscles, with the salpingo-pharyngeus, the former dilating the opening (Rüdinger and Tröltzsch), the latter muscle drawing the inferior curved edge of the orifice of the tube into a straight line upwards. The palato-pharyngeal muscle assists in fixing the cartilaginous portion. This action we are frequently performing in the swallowing of our saliva. It is this action of the palatal muscles that we take advantage of in inflating the membrane by Politzer's method during the act of swallowing the water; the walls of the Eustachian tube are forced apart and the floor carried upwards.

It permits of an exchange of air to the cavity of the tympanum; thus it forms an outlet for abnormal secretions, and prevents their accumulation in the tympanum.

It prevents the rarefaction of the air in the tympanum by the successive acts of swallowing when air can enter the cavity at each act.

It maintains a condition of equilibrium between the air in the tympanum and the atmosphere.

It may influence the vibration of the membrane and the resulting sonorous effects on the tympanic cavity (Bernstein): clinical analysis would appear to verify the suggestion.

The valvular action of the tube has the most important bearing on our

knowledge of Eustachian deafness. Closure or occlusion of the tube leads to rarefaction of the air in the tympanum. This is followed by an accumulation of mucus in the tympanum, and an increased concavity of the membrane, and finally inspissation of the secretion, contraction of the *membrana tympani*, and thickening and adhesion of the membrane lining the cavity, with accompanying changes in the ossicles.

The manometer of Politzer is a small glass tube which, by its india-rubber covering, can be hermetically sealed in the meatus. During the first part of the act of swallowing with the closed mouth



FIG. 11.—*Politzer's Ear Manometer.* A person again swallows with open nostrils, when it again rises to its former position. The same fact is often experienced by the patient after auto-inflation of the tympanum by the air balloon on swallowing a little saliva. After the inflation, the Eustachian tube being temporarily closed, a sense of distension and slight deafness is experienced, the voice sounding rather muffled. All this disappears on the reopening of the tube during the next act of swallowing. Likewise, as Politzer has shown, the sound of the tuning-fork held before the open nostrils is increased during the act of swallowing, the vibrations finding access more readily through the open Eustachian tube. The glandular elements of the mucous lining of the tube, especially in children (Gerlach), at the pharyngeal or cartilaginous end, are to be noted in connection with follicular states of the pharynx hypertrophy of these glandular elements tending to obstruct and close the tube, especially in children.

THE MASTOID PROCESS.

To every surgeon the anatomy of the mastoid process and the mastoid cells is of the greatest interest. This I exemplify elsewhere (see chapter on Inflammation and Abscess of the Mastoid Cells). The clinical conditions especially

imposing on the practitioner the necessity for studying carefully the surroundings of the mastoid cells and their relation to the external meatus, tympanic cavity, middle cranial cavity, the sigmoid fossa and lateral sinus, are inflammation and suppuration occurring in the meatus and tympanum extending to the mastoid cells.

The responsibility devolving on him under these circumstances of incising the mastoid, or, in certain cases where suppuration has occurred, of trephining the mastoid cells cannot be shirked in the face of our modern knowledge of the benefits resulting from these steps, and the saving of life which follow on their successful performance.

The "landmarks" for trephining the mastoid cells or antrum, for the more accurate definition of which we are especially indebted to Schwartz and Hartmann, are given in the description of this operation (chapter on Mastoid Inflammation and Abscess).

The mastoid cells are bounded in front by the osseous meatus and tympanum, posteriorly by the diploe of the mastoid process; above them is the plate of bone which roofs in the cells and the cavity of the tympanum, separating both from the dura mater. Below this plate of bone is the antrum mastoideum, which communicates with the upper and posterior part of the tympanum. Beneath the mastoid cells is the mastoid fossa for attachment of the sterno-mastoid muscle. Internally is the plate of bone grooved (sigmoid fossa) for the reception of the lateral sinus. Externally the cells are limited by the convex osseous plate, varying in thickness in different individuals behind the auricle.

I have in my right mastoid outer plate a partial dehiscence, and in the groove in the bone lies a large vessel. I have only seen one example of a similar sulcus. This in the case referred to, an adult, amounted to a complete dehiscence. (Schwartz, Schmitt, and Wernher have reported instances of emphysema caused by the escape of air from the tympanic cavity into the subcutaneous cellular tissue in cases of dehiscence of the mastoid process.) Politzer mentions the possibility of a dehiscence of the inner plate of bone separating the cells from the venous sinus.

The varying thickness of the osseous partition between the cells and the

venous wall is of practical interest, not alone in regard to operations on the mastoid cells or threatening suppuration, and its consequences should the destruction of the bone extend, by thrombosis, embolism, and septicæmia, but also to the influence exerted by venous fulness, and distension on subjective disturbances of hearing and vertiginous tinnitus aurium. The relative thickness of these outer and inner walls of the mastoid process in children and adults explains the greater frequency with which meningitis follows disease of the middle ear in the latter, as in adult life the inner table is in proportion much thinner than it is in infancy and childhood, whereas it is the reverse with the outer. Hence the greater tendency for the pus to find its way into the mastoid cells. The exit of any purulent collection from the mastoid cells is furthermore hindered by the floor of the mastoid antrum being at a lower level than that of the tympanic cavity.

That recurrent abscess and periostitis in the external meatus and otitis media should be followed occasionally by suppuration in the mastoid process is explained by the anterior wall being formed by the osseous meatus, the lining membrane of which, as we have seen, is continuous with that of the tympanic cavity.

The variations in the size and consistency of the mastoid process in different persons has to be borne in mind, the relative proportion of pneumatic space, osseous, structure, diploë or sclerotised tissue being quite different in various mastoid processes, as shown by Zuckerkandl. This variety in depth and density explains the comparative facility or difficulty met with in trephining the mastoid. The density of the bone has a still more important bearing in regard to operations and disease of the mastoid, for an advanced position of the lateral sinus renders it specially liable to injury in such operations. The more pneumatic and well developed the mastoid, the more favourable the position of the sinus (Politzer). In some cases there is but a small space between the sinus and the posterior wall of the meatus.

LABYRINTH.

There are some special facts, anatomical and physiological, bearing on the correlative functions of the middle ear and

labyrinth, that must be remembered in affections of the latter. They may be thus briefly summarised :—

Perilymph.—(a) The communication between the arachnoid space (cerebro-spinal cavity) and the fluid perilymph of the labyrinth through the aqueductus cochleæ; (b) the normal mobility of the membrana tympani is essential, not alone for the transmission of the endless variety of vibrations through the ossicles to the perilymph, but this constant correlation of the yielding drum-head to the air in the tympanic cavity, and of the movable stapes to the perilymph, is the index to the degree of pressure on the endolymph.

Vascular.—(c) The arterial supply of the labyrinth through the basilar artery, the semicircular canals and cochleæ; (d) the venous discharge of the labyrinth into the petrosal sinus and jugular vein, and the communications both arterial and venous between the vessels of the tympanum and those of the labyrinth in the osseous partitions between the middle and internal ear (Politzer); (e) the connection thus established (in disturbing conditions of the circulation more especially) between the internal carotid, external carotid, and vertebral vessels, a connection of still greater importance pathologically when we remember the large size of the tympanic capillaries, and possibly (Prussak) the direct passage of arteries into veins without any capillary intervention, while such a vascular link of communication being maintained in osseous structures must, in varying conditions of arterial or venous tension, whether local in the vessels of the tympanum or labyrinth, or general through cardiac or other causes, peculiarly affect the blood-pressure, both in the tympanum and the labyrinth.

Professor Politzer, to whom we are more especially indebted for the knowledge of these anatomical facts, says :—“From pathological and clinical observations, there can be no doubt but that hyperæmia and congestion of the vessels of the middle ear accompanied with inflammation owing to these anastomoses, sometimes extend to the vascular regions of the labyrinth, causing there temporary or permanent disturbances of nutrition.”¹

¹ Politzer, *op. cit.*, p. 49.

Nervous.—(f) The free distribution of vasmotor nerves to the arteries supplying both labyrinth and tympanum; (g) the connections of the roots and nuclei of the auditory nerve with the peduncles of the cerebellum, the floor of the fourth ventricle, the medulla oblongata, the contiguity of the auditory nuclei to those of the facial, sixth, and eighth pairs of nerves; (h) the decussation of the fibres of the roots which maintain a connection between the auditory nerve of one side and the nuclei of the opposite nerve, and with the corresponding side of the cerebellum; (i) the relation of the temporal lobe of the cerebrum (Munk and Ferrier) to the sense of hearing (hearing centre), and the experiments which point to a decussation of the auditory nerve fibres in the brain; (j) the nerve connections established through the spheno-palatine and otic ganglia of the fifth nerve and its superficial petrosal branches with the sympathetic, facial, and glosso-pharyngeal on the one hand (tympanic plexus), and on the other, those connecting branches of the facial, glosso-pharyngeal, and pneumo-gastric with the nerves supplying the Eustachian tube, tensor

palati, soft palate, and naso-pharyngeal mucous membrane; while worthy of special notice is the distinct supply of the tensor tympani (fifth nerve) and of the stapedius (facial), the "activity of the former muscle being regulated by reflex action" (Forster).

Muscular.—(k) The action of the tensor tympani and stapedius muscles in regulating the degree of pressure on the labyrinthine fluid through the stapes and fenestrae; (l) the healthful action of the tubal muscles (levator and tensor palati) in opening the Eustachian tube during deglutition and in certain acts of phonation, thus securing the normal conditions of equilibration in the tympanic cavity, preventing condensation of the contained air, and in consequence maintaining free ossicular movement and the necessary and correlative response of the membrana tympani externally and the membrane of the fenestra rotunda internally, while due equilibrium is sustained in the fluid of the labyrinth.

The anatomical and physiological relation of the naso-pharynx to the ear are briefly alluded to in the chapter on the naso-pharynx.

CHAPTER VI.

SYMPTOMATOLOGY.

PAIN—DISCHARGE—DEAFNESS—TESTING THE HEARING—SPEECH—WATCH—PARACUSIS WILLISIANA—PARACUSIS LOCI—RESEARCHES OF OSCAR WOLF—TESTING CHILDREN—ACOUMETER OF POLITZER—TURNBULL ON THE PERCEPTION OF MUSICAL TONES.

SOME general observations on three of the most prominent symptoms—some or all of which are met with in every ear case, namely, pain, discharge, and deafness, may be well made before we consider the examination of a case in detail. The fourth and very general symptom, tinnitus, I shall devote a special chapter to the full consideration of. With this latter I shall consider giddiness and vertigo.

PAIN.

Pain, more or less violent, is present in all acute inflammatory affections of the ear. For instance, it is, as a rule, very acute in ordinary furunculus, in abscess of the meatus, in myringitis, acute

perforation of the membrana tympani, and inflammation of the mastoid cells. Under any of these conditions pain may produce a state bordering on delirium, so wild and fierce may it become, especially at night. The constant deep throbbing pain, when mischief has extended to the internal ear, is peculiarly intense and intolerable, while it is most difficult to relieve. It radiates over the side of the head, and is frequently accompanied by frontal ache and great intolerance of light.

In children especially is the occurrence of pain of importance, as it is often the only guide to the malady from which the little ones suffer; the carrying of the hand to the head and to the affected ear

drawing the attention of friends and physician to the seat of the mischief long before the occurrence of discharge. In many cases it is surprising that so abnormal a condition of things as we find present may exist without the occurrence of pain.

Constantly we see persons with evidence of long-standing disease, as exostosis of the meatus, polypus, thickening of the membrana tympani, and even perforation of the same, thickened states of the membrane of the cavity of the tympanum, or ankylosis of the ossicles, all lesions of a chronic character, in which no pain has been complained of, and in which patients deny its existence. Some of the most intractable forms of deafness, with nerve complications, are those in which there never has been from first to last any pain. The presence of pain is of value chiefly in showing the acute nature of the attack, and (excluding causes existing in the meatus) will point to inflammation of the membrane, or, if there be no appearance of such, to mischief in the cavity of the tympanum or in the internal ear. The advent of acute pain in an old-standing case of aural disease, where there is not any manifest cause for its occurrence, should always be looked on with suspicion, the more especially if such be accompanied by any general constitutional symptoms, such as a rigor, vomiting, alterations in the pulse, constipation, or drowsiness. Pain in the ear under any circumstances should, both in old and young, receive immediate attention, and its source be carefully ascertained.

Pain of a neuralgic character is not uncommon. It resembles neuralgia occurring elsewhere in the acuteness of the suffering and the periodicity of the paroxysms. On examination we find no cause to explain its presence. At times some slight hyperaemia of the tympanic membrane is present, there may be tenderness in manipulating the auricle, but I have frequently seen violent neuralgia of the ear when no inflammatory condition was coincident with the pain. I have already referred to a form of neuralgia which is due to malarial causes (see Chap. IV.) We constantly meet these neuralgic states, in debilitated conditions arising in spring and autumn with frequent atmospheric changes and alternations of temperature.

Nor must the possible and even probable cause of the neuralgia in a carious tooth or neglected stump be overlooked.

Earache, in patients in whom we can discover no source of the pain, should always prompt a careful examination of the teeth. As in the case of the eye and retinal affection, or other morbid states of the ocular tunics, so in the ear, the tinnitus and interference with hearing may owe their origin to irritation in the dental division of the trigeminus. The pain may be purely reflex. Dr Lauder Brunton has drawn special attention to carious teeth and stumps as a cause of neuralgia and headache.¹

DISCHARGE.

The length of time a discharge has lasted, and the conditions which have preceded its occurrence, the fact of its being coincident with pain or relieving it, its nature, whether purulent or mingled with epithelium and mucus or blood, its quantity if there is any foul smell, should be separately inquired into. One clear rule should always be observed, namely, to regard discharge from the ear as but a sign secondary to some diseased state of the auditory passages, and one which must be dealt with only after ascertaining its exact source. Nothing can be more mischievous than to regard the mere discharge as the disease, and to remain satisfied with undivided attention to it without arriving at a correct conclusion as to its cause. Frequently I have seen polypus, perforation of the membrane, destruction of the ossicles, inflammation of the mastoid process in cases treated as "otorrhœa," while these serious complications have been overlooked from neglect of the simple precaution of examining an ear carefully with a speculum when the discharge has all been removed. As a diagnostic sign, discharge is valuable in directing our attention from the external meatus to the middle ear, the constant source of its presence.

DEAFNESS.

We have not the same means of estimating accurately and recording the normal standard of the hearing power in the healthful ear as in the testing

¹ Brunton, *Disorders of Digestion*.

of vision of the eye. In different persons, whose hearing is for all practical purposes normal, we find a considerable difference in the perceptive power of the ear, both in estimating the degree of loudness of sound, differentiating musical notes, recognising various tones, and in localising the direction of sound. In making a diagnosis we have to take account not merely of the hearing of the waves of sound transferred through the air to the auditory apparatus, but also the perception of the sound waves, transmitted through the cranial bones by conduction.

In ordinary practice the watch, the tuning-fork, the finger nail, speech, are the familiar means of testing hearing. It is necessary to refer to each of these methods before describing those appliances not so likely to be in the hands of the practitioner, and even without which he can arrive at a fair approximate estimation of the hearing distance of the ear under examination. With regard to the watch it is imperfect as a test, first, because it cannot enable us to test the hearing power for more than two, frequently not very distinct tones; secondly, it does not afford an accurate record of the standard of hearing, save with the tone of the particular watch employed, as all watches vary more or less in the loudness or sharpness of the tick; and thirdly, from the tendency there is both for adults and children to deceive themselves and us in fancying and asserting they hear the watch if they see or know that it is applied against or held any distance from the ear. It is by no means a good method of testing the conduction of sound through the osseous structures.

We may partly meet some of these objections by using a stop-watch which places the continuance of the sound under our control, and conceals from the patient the time of its commencement or cessation. I use a stop-chronograph repeater, which strikes the quarters with a duplex bell sound. This is most useful, as it enables the examiner to test children at various distances with their backs turned to him, and in the recovery of the hearing enables us to judge correctly of the improvement.

The little patient is attracted by the strokes of the repeater and the chimes. Placing the child at various distances

from us, we can direct him to turn quickly round as the watch strikes or chimes; this he readily does, and we can thus gain a pretty fair estimate of the hearing power.

By slipping a watch from one hand to the other, and keeping the patient's face turned from us in holding it to the ear, we may easily test the veracity of the child. Stupid and nervous children do not intentionally deceive, and it is a mistake on the part either of surgeon or friends to threaten or speak to them harshly while testing their hearing.

It is necessary to thoroughly occlude one ear, as the tones may not be heard with the ear we are testing, but with the other.

It is well to repeat a few times the experiment with either ear, beginning close to the ear, and approaching the ear from a distance. It will often be found that the patient can "follow" the sound when the watch is held at first close to the ear and then is moved gradually away, while, if we commence at some distance and gradually approach the ear, he will require to have the watch brought much closer to the ear to catch the tones. In one consulting room I have two clocks in different situations which have different tones. A large proportion of patients I find do not hear the two of these clocks at the same time. Some hear that with the deeper tone, others that with the sharper. Often immediately after Politzerising them they will hear the two distinctly, and this when they have not before been made aware that there were two in the room. If the attention is drawn to the fact that there are two clocks, some persons will then immediately recognise the two sounds. This difficulty of hearing does not appear to depend so much on the loudness as on the character of the tone, as the loudest of the two is not that generally heard. Those who cannot hear the two ticks at the same time in the first instance I find are generally the persons to whom table conversation is difficult if many people are talking together. My watch I find I hear equally well with either ear at one hundred inches. Normal hearing I therefore estimate with my watch at $\frac{100}{100} = 1$. I commonly adopt the following method to note the hearing distance with the watch:—

H.D.W. = n = 1.

W. = $\frac{1}{100}$ = $\frac{1}{2}$ inch distance.

W. = $\frac{1}{50}$ = 1 "

W. = $\frac{1}{25}$ = 2 " and so on.

W. = $\frac{1}{10}$ = 0 not heard.

W. = C = heard on contact with the ear.

The tuning fork is so important an aid in differentiation that the reader must refer to the chapter on "Diagnosis" for directions for its use. With it we can test the power retained for the conduction of sound through the osseous structures, by placing it (and some with different keys) on the head, over the mastoid process, and on the teeth. We can thus try it with the normal ear and the affected one, and judge by contrast of the relative time the perception of sound lasts.

If the watch is not heard on contact, or barely on or off contact, the nail furnishes a useful test in some cases, the distance at which the click of the nail in varying degrees of sharpness is heard being noted.

In speech we have another important test of hearing. We must turn the patient's face away from us during examination, and engage him in conversation at different distances. He should be addressed in whispered speech. The fact of his hearing better in the presence of noises should be recorded (Paracusis Willisiana), or in a railway train, or worse, at a dinner table, when many persons are speaking, being then unable to follow the general conversation.

There is a certain set of symptoms, some of which are almost invariably met with in every case where we have ankylosis, adhesions, or rigidity of the membrane lining the cavity of the tympanum. A lucid description of the typical symptoms which are complained of by the great majority of patients who have adhesions of the membrana tympani and ankylosis of the tympanic bones is given by Mr Toynbee. There are no more important passages in his work on *Diseases of the Ear* than those in which he so clearly depicts those symptoms so well known to all aural surgeons, and which when described by a patient almost infallibly point to the seat and nature of the affection.

"Many patients will most distinctly hear a single voice, although low, but are puzzled to hear anything distinctly when two or more persons are speaking;

others hear the voice, but cannot discriminate the words; others again can hear slow conversation, but cannot follow it when rapid. These symptoms show that the *adapting power* of the ear, dependent as already shown upon the ossicles and their muscles, is at fault. But the history of the case, showing it to be one of slow hardening of the tympanic mucous membrane, together with the absence of all those symptoms which render it liable to be confounded with other diseases, as nervous deafness, obstruction of the Eustachian tube, &c., are usually sufficient to enable an attentive observer to form a correct diagnosis.

"Thus the patient will hear perfectly a single distinct voice, but a second voice intermingling completely disables him from hearing either, he having lost the power of rapidly adjusting his ear to suit the sound of the voice of the person immediately addressing him to the exclusion of that of the other. Yet another striking symptom of the early stages of the affection is the necessity of exercising an act of distinct volition in order to catch the sound of a voice, which ceases to be perceptible as soon as the effort is relaxed. It has, indeed, happened to me to receive patients whose complaints consisted not in being dull of hearing, since they could hear everything said in a room, but in not being able to do this without a prolonged effort of attention, the fatigue of which soon became intolerable. This latter condition is, of course, perfectly explicable from the more or less rigidity of the chain of bones in this disease, and the muscular effort consequently required to move it and keep it in constant motion.

"Another symptom, and one certainly characteristic of the latter stages of this affection, but which it is not in my power to deny, may not also be present in another disease of the ear, is the immense improvement of the hearing which attends the patient's travelling in a carriage over a hard road, by which considerable vibration is communicated to his body; a vibration that doubtless in a degree shakes the chain of bones, and imparts to them a kind of vibratory movement, which permits the muscles, while it lasts, so to act on those bones as to restore more or less of their proper functions in adjusting the pressure on the labyrinth."

This symptom points particularly in my experience to affections of the middle ear and ankylosis of the stapes. Tröltzsch thought that in the case of persons hearing better during noises, distinct vibrations brought the stapes and incus closer together through the inward pressure of the *membrana tympani*, and thus prevented the interruption to the conduction of sound caused by an abnormal separation of these bones. Toynebee's view, that adhesive inflammation had produced ankyloses, and that the symptom was pathognomonic of this affection and incurable, is that taken also by Politzer.

Error in judging of the direction of sound (*Paracusis loci*) is met with in a certain proportion of patients suffering with middle ear affections. The cause of this affection appears rather to be in the sound conducting media than in the labyrinth. I discover its presence more frequently of late since I have tested patients by the two clocks I have alluded to. It exists frequently in those persons in whom I have no doubt there are ankylosed states of the articulation and ossicles. It will be observed that some patients never appear certain of the direction of the sound without turning the head to look from the clock or the place from which they think the sound issues (Politzer).¹ As it is a fact that our accurate judgment of the direction of sound is dependent on hearing with both ears, which fact can be proved experimentally in persons whose hearing is normal, and is the result of the education of the aural synchronously with the ocular sense, it happens that when the hearing is not assisted by vision, and that still further, either through interference with the transmission of sound in the external meatus or its conduction by disease in the middle ear, the binaural hearing is interfered with, this judgment of direction is either lessened or lost. This error of hearing may be of considerable moment in the case of railway officials or sportsmen, and those engaged in military service.

As the researches of Oscar Wolf have proved that the pitch of the fundamental note varies in the pronunciation of the different vowels, and further that this

difference exists in a greater degree between the vowels and consonants, the latter are heard much less distinctly.

Politzer has shown experimentally that "if words are spoken into the meatus through a speaking trumpet, the ossicula exhibit as many vibrations as there are syllables in the word, and that the greatest excursion of the vibration corresponds with the vowel of the syllable."

Taking a few of Oscar Wolf's conclusions regarding the relative distances in meters at which the sounds of certain vowels and consonants can be heard, we have these facts well exemplified—

A = 252 pronounced (as in *hart*), O = 245, E = 231 (as in *end*), I = 238 (as in *ei*), $\text{I}' = 210$ (as in *inch*), U = 19·6 (as in *hun*), S = 123·5, K = 44·1, B = 12·6 (as in *before*), H (aspirate) = 8·4.

It must also be remembered that the pitch and volume of different persons' voices vary considerably in ordinary conversation, and in the same persons at various times and in different days dependent on atmospheric conditions, the state of the larynx and the tension of the vocal cords, or the amount of noise present at the time he is conversing. We must recollect that in testing with the watch and by whispering much will depend on the surrounding stillness. In a back room used for aural and ophthalmic purposes, which is 60 feet from the street door of my house, and which can be closed from the hall by two doors, in absolute silence, I can carry on with some patients a whispered conversation, which would not be heard in any ordinary study, and the watch can frequently be heard at double the distance that it is in the room nearer the street, though this is also a back room.

In the treatment of patients it will frequently be noticed that, while there is no improvement in the hearing of the watch or but very slight, the conversational power is decidedly increased, and on the other hand, that though there be marked increase in the distance at which the watch can be heard, for conversational purposes there is no gain (see chapter on Deaf-Mutism).

The facilities with which certain persons follow conversation by watching the lip movements of the speaker has to be remembered. This is especially noticeable in the case of children and young persons who

¹ Politzer, *loc. cit.*, p. 200.

have become deaf after they have learned a number of words and the alphabet. Quite recently I saw a child, aged 5 years, absolutely deaf to loud noises, who was able to understand a number of sentences when spoken to him by his mother. The ease with which he understood speech made her doubtful of the boy's loss of hearing.¹

In trying these young patients for the possession of hearing power they must not be allowed to see the source of the noise, and it is better to blindfold them during examination. It will be found that many will hear the tuning-fork when placed on the head or over the mastoid who did not hear such sounds as

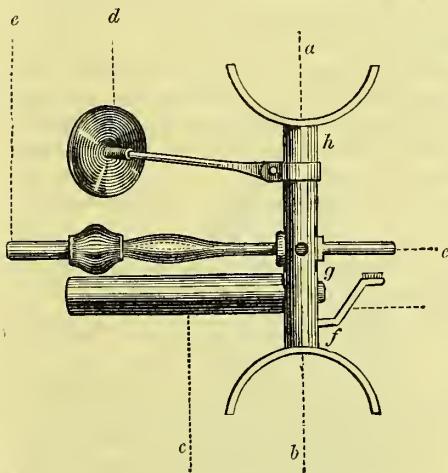


FIG 12.—Politzer's Acoumeter. *a* and *b*, Semicircular vulcanite ends of pillar for forefinger and thumb; *h*, vulcanite pillar; *c*, steel cylinder; *e*, *e*, steel lever hammer; *f*, vulcanite check on which to press the lever hammer; *d*, brass plate at end of steel pin (which in the recent instrument, screws into the vulcanite pillar at *h*). In the improved acoumeter the vulcanite pillar and check plate are made of one piece.

the piano, a whistle, or other loud noise. In these cases the inference is that there is a certain degree of perceptive power retained in the auditory nerve.²

Politzer's acoumeter, which I have for some time employed as an accessory test of the hearing, is shown in the figure of its actual size. It consists of a horizontal steel cylinder tightly fitted by a screw to a perpendicular vulcanite pillar, while a lever percussion hammer is so arranged in the vulcanite pillar that by pressure on the short arm of the lever the hammer is made to fall on the steel cylinder and produce the tone. The degree of depre-

sion of the lever is limited by the rubber check plate (*d*), while the instrument is held between the forefinger and thumb at *b* and *a*. The acoumeter is also furnished with a metal plate (*i*), which can be used to test sound conductions through the cranial bones by pressing it over such bones as the temporal or mastoid, and the external meatus where the tones are not heard save in contact. For this purpose the acoumeter will be found most useful. The distance at which the tone produced by the lever hammer is heard is measured by a centimetre measure, a greater distance by a metre scale previously determined and worked in the consulting-room. For the reason before stated in the case of the watch, the hearing distance is measured by gradually bringing the acoumeter nearer the ear until the tone is heard, while the eye of the same side as that of the ear tested is occluded, so that the patient cannot see the instrument or know the direction of the sound. Fifteen metres was the distance fixed by Hartmann and Politzer as the average normal distance of hearing for the acoumeter. (The acoumeter can be had of Messrs Krone & Seseman, and Mayer and Meltzer, or Maw, London.) It has the advantages of (1) uniformity and intensity of tone; (2) a greater correspondence to the voice and whispered speech than the watch; (3) its simplicity and size.

Dr Turnbull has made some interesting experiments to test the power of perception of musical tones by the human ear. He used König's rods. "They were made of choice white tempered steel. These are held suspended by a silk thread, either close to the ear, or at a definite distance, say 35 feet, from the patient, and then tapped on the end with a little steel hammer, which causes a clear, ringing over-tone like a bell. They are two centimetres in diameter, and from two and a half to ten centimetres in length, so that they regularly increase from 20,000 to 60,000 vibrations in the second, according to their size." They were held within two inches of the ear; their temperature was about 70° Fahr. The observations were made in a room remote from noise, and during cloudy weather. With these rods he could accurately test the perception of the finest musical tones. From the table he has published, the

¹ See chapter on Deaf-Mutism.

² Can be had post free from Gottlieb of Vienna for 10s.

average capacity of the normal ear for high tones between the years of twenty and thirty would appear to range from 40,000 to 60,000. It was a little lower in the advanced periods of life. In several of the cases where a marked difference was observed between the two ears, this was in favour of the left, with the single exception of the case of the gentleman who distinguished 60,000 with his right ear, and who could get no higher than 55,000 with his left.

The marked difference between the limit at twenty-two and that at fifty-seven years is believed not to be due simply to senile thickening of the membrana tympani, but also to a gradual narrowing and change of shape in the auditory meatus, together with alterations in the middle ear, diminution of conducting power of the bones, and diminished susceptibility of the auditory nerve, incident upon advancing years.¹

CHAPTER VII.

DIAGNOSIS AND METHOD OF EXAMINATION.

APPLIANCES NECESSARY FOR DIAGNOSIS—STEPS OF EXAMINATION—EXTERNAL MEATUS—THE MEMBRANA TYMPANI—METHOD OF USING SPECULUM—VARIOUS FORMS OF AURAL SPECULA—WEBER-LIEL'S EAR MICROSCOPE—THE OTOSCOPE—SIEGLE'S SPECULUM—POLITZER'S AURAL BAG—DIAGNOSIS OF PERFORATION—THE TUNING-FORK IN DIAGNOSIS: RULES FOR USE OF—PAST TREATMENT—EXAMINATION OF THE MOUTH AND NASO-PHARYNX—ANTERIOR AND POSTERIOR RHINOSCOPY—METHOD BY PALPATION.

DIAGNOSIS: METHOD OF EXAMINATION. It may be well here to mention the apparatus which are essential, in order that we may successfully diagnose affections of the ear:—

Bull's eye Argand burner and universal bracket (same as that used for the laryngoscope).
Laryngoscope reflector, with spectacle frame, or on handle.
Double otoscope.
Various sizes of aural specula.
Author's aural probe and absorbent wool.
Tuning-forks (different keys).
Pneumatic speculum.
Eustachian catheters (different sizes).
Bougies, nasal and Eustachian.
A Politzer's bag.
Ear syringe.
Small Pravaz syringe for Eustachian catheter and bellows.
Ear forceps, lever ring and rectangular.
Knife for incising membrane (myringotome).
Turnbull's Eustachian forceps.
Snares for polypus.
Artificial membranes.
Tongue depressor.
Nasal specula.
Nasal douche.
Laryngeal mirrors and reflector.
Mirror for rhinoscopy.

This includes most of the instruments requisite, not alone for diagnosis, but also

for the treatment of any aural affection, certainly such as would be required in practice.

STEPS OF EXAMINATION, HISTORY, SYMPTOMS, ETC.

The following method of examination is that which I usually adopt, and will be found adequate in general practice:—

History of case, including residence, occupation, duration of deafness—Mode of onset. Causes.
Hereditary influences.
General health.
Past treatment.
Present symptoms, including—
Tinnitus.
Giddiness.
Pain.
Discharge.
Evidence of constitutional taint.
Hearing distance with watch, click of finger nail, speech, acoumeter.
External meatus (condition of).
Otoscope and Politzer's inflation.
Membrana tympani (condition of), with cavity of tympanum.
Tuning-fork.
Eustachian tube (state of).
Throat (state of).
Nasal cavities and naso-pharynx (state of).

This can be briefly entered in the sur-

¹ Professor Hughes devised an audiometer to measure accurately the power of hearing in a deaf person, and to afford a means of exactly testing the bearing at intervals when a patient is under treatment. It consists mainly of an appliance in which the telephone is adapted by means of the inventor's microphone key to convey the most delicate gradation of sound (up to absolute silence) to the ear. It is worked by two Léclanche's cells, and the intensity of the sound is regulated by a moving coil placed on a graduated bar between the two primary coils.

geon's case-book, space being left for the above particulars, tabular form, thus:—

No. of Case—Name—Age—Occupation—History, &c.

SYMPTOMS.

	Right ear.	Left ear.
<i>Before and after inflation by Politzer's method.</i>		
H. D.,		
E. M.,		
M. T.,		
T. C.,		
T. F.,		
E. T.,		

Naso-pharynx.

Throat.

G.H. (General Health).

Examination.—Having noted the general state of the patient's health, the first step is to inquire the length of time the deafness has lasted, if both ears are affected, and if so, how each has been attacked; next to note carefully the manner in which the deafness has progressed, if this progress has been rapid or insidious, with or without pain or discharge. A careful examination and comparison of the hearing power of the two ears is

now requisite in every instance. Patients constantly affirm that the hearing of one ear is perfect, yet on coming to test it accurately we may find it more or less impaired, the reason of this being that, while the conversational power is not interfered with, the hearing distance as measured by the watch is considerably so. We should now seek closely for some cause, making inquiries into the habits, occupation, state of health at the time of or preceding the invasion of the symptoms. The connection of deafness with the exanthemata is a point which should not here be overlooked, these and the various fevers being frequent causes of deafness. Cold, rheumatism, gout, and syphilis should not be forgotten, the last, both as a direct and hereditary source of mischief.

It is surprising the minute portion of

cerumen which, if it rests on the membrane, will cause tinnitus.

In 1880 I was consulted by a gentleman for noises in the ear; the hearing power was normal, and on examination I found the membrane healthy, and the only discernible cause of the annoyance was a small collection of cerumen which lay close to the membrane, and which, perhaps, had been pushed further in by that most reprehensible practice, namely, attempts to clear out the ear with pieces of rolled paper, or the end of a towel, &c. On gently syringing the ear, I removed with the small atom of cerumen a hay seed, which had escaped my notice, lying, as it did, flat against the wall of the meatus.

EXTERNAL MEATUS AND MEMBRANA
TYMPANI.

Having ascertained the characteristic

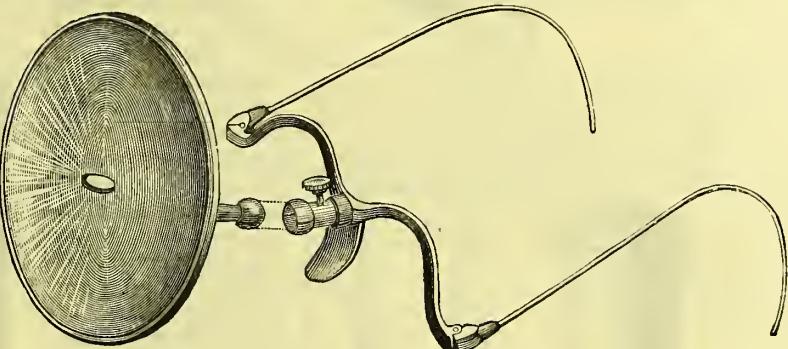


FIG. 13.—Spectacle Reflector for Forehead.

symptoms from which our patient suffers, the mode of their occurrence, and the nature of their progress, with such personal or family history as may be of importance, we next proceed to examine the present condition of the auditory passages. I shall here merely detail the steps which it is necessary to take, as it will be requisite to refer to each part specially in considering the various morbid conditions requiring treatment. The external meatus (excluding for the present affections of the auricle) is first to be examined. For this purpose we must have at hand a reflector, a few different sized specula, an ear syringe, the aural probe, and some cotton-wool. It is well to have these means of thoroughly cleansing out the canal, and removing any small portions of epidermis, cerumen, or fungus which may remain after the syringing, and

which would interfere with a full view of the meatus and membrane.

It is, of course, necessary to possess a



FIG. 14.—Vulcanite Slice for the Ear (Maw).

FIG. 15.—Aural Spout for the Ear.

good syringe—I generally employ the one here figured; I prefer it to the many I have been in the habit of using. I rather like the screw nozzle—it does not

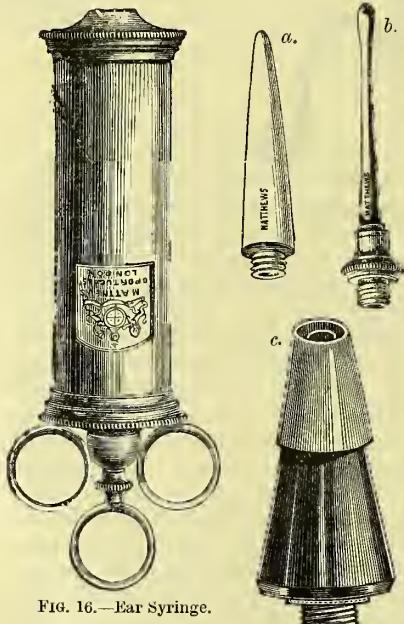


FIG. 16.—Ear Syringe.

get out of order so readily as the one that merely fits on. This latter frequently becomes loose after it has been in use for some time. The narrow metal nozzle

(b) shown in the drawing is also very useful for removing cerumen, and will be found much more efficacious than the one with the larger bore; also the vulcanite nozzle (c) with the india-rubber cap, can be screwed on to the syringe easily. This nozzle is indispensable for the treatment of cases of perforation of the membrane. The conical india-rubber end fits well into the meatus. The patient is directed to hold the head forwards over a vessel, and the stream is passed through the ear, and flows from the Eustachian tube through the nostril. We are thus enabled to wash out the cavity of the tympanum, remove secretions, and clear the Eustachian tube with disinfecting solutions (see Remarks on Syringing in Chapter III., also Treatment of Perforation of the Membrana Tympani).

Messrs Mayer and Meltzer have devised a new form of syringe with a reservoir of vaseline in the piston, which secures its free movement. Generally speaking, all oleaginous and greasy matter about the inside of a syringe is harmful. The interior of the instrument should be kept scrupulously clean. The piston should be regularly washed in such disinfectant solutions as those of permanganate of potash or bichloride of mercury, and vaseline used to lubricate it. Every day after use some disinfectant solution should be passed through the syringe. Such precautions are absolutely essential, otherwise fungi and impure solutions mingled with organic particles, carried from the interior of the syringe, are apt to be introduced into the patient's ear.

I use my aural probe or cotton-holder for the purpose of thoroughly cleaning the meatus and membrane.

Welde's forceps, or the rectangular one devised by Hinton (fig. 21), or the



FIG. 18.—Ear Syringe.

FIG. 17.—Nozzles for passing stream through the Middle Ear.

small alligator forceps, may be required to detach adhesive epidermis, cotton-wool, portions of hard wax, or foreign bodies. The rectangular forceps will be found, perhaps, the most useful; it is lighter, and the teeth being so perfectly adapted, the smallest particle may be grasped with it and withdrawn. It does not in the least interfere with the view of the meatus, and may be used through a wide speculum.

We have now to place our patient in a good position for examination and to introduce the speculum. When we can take advantage of it, there can be no doubt that good daylight gives a most distinct illumination. This was Hinton's opinion also.

A beautiful view of the membrane may be obtained by means of sunlight, but the light must be thrown rather on the wall of the meatus than directly on the membrane, as by its intensity it dazzles and prevents us seeing distinctly. It will be found convenient to examine the patient standing, so that he can be quickly turned in any direction. The patient should be opposite the surgeon, and partly between him and the light.

A child is best examined sitting on the lap of the mother or standing on a chair, the head, if the child is restive, being fixed by the mother or some assistant. The mirror with the spectacle frame ordinarily used in laryngoscopy, with the ball-and-socket joint, will be found the most useful, as with it we can either examine with the hand, or with the mirror on the face.

With a little practice full view can be had from the face-mirror, and if there is any manipulation necessary, it is the best method of using the mirror, as we have then both hands free to operate with. If we use artificial light, and

employ the bull's-eye burner, with the lever bracket, to be had of any instrument maker, the patient must be placed sitting, and with the light a little to the side of and behind him. Any one can, after a short time, familiarise himself with the steps necessary to make a complete examination by this method.



FIG. 19.—Aural Probe armed with Cotton-Wool.



(a)

FIG. 20.—Aural Probe.

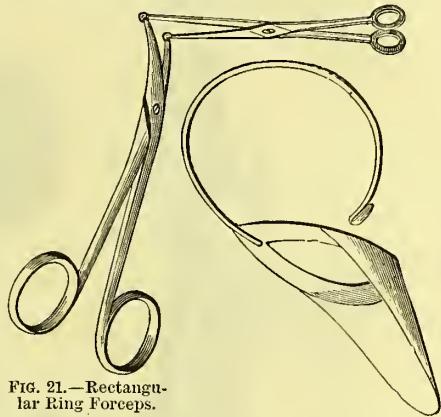


FIG. 21.—Rectangular Ring Forceps.

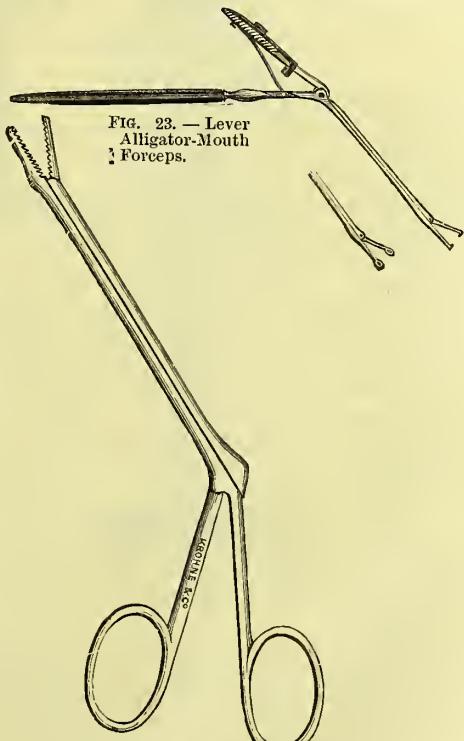


FIG. 22.—Aural Spout with Spring.

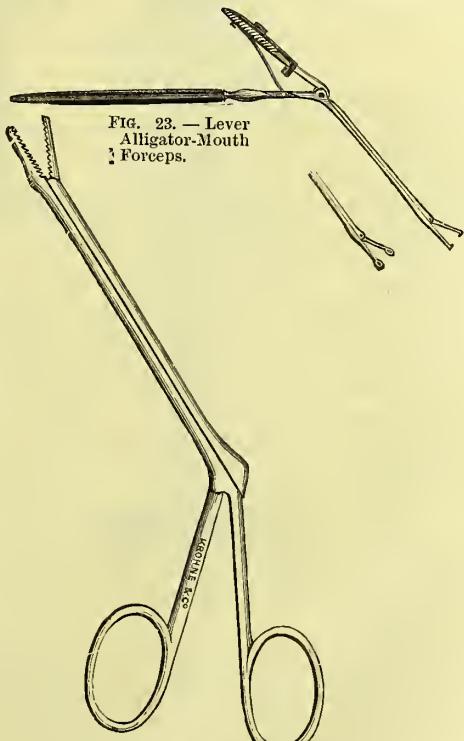


FIG. 23.—Lever Alligator-Mouth Forceps.

FIG. 24.—Alligator Forceps.

For bedside purposes, and in houses where we are called to see patients at

night, Messrs Weiss have devised a very useful portable lamp. It is contained

added to the natural sensitiveness an inflammatory state which makes the

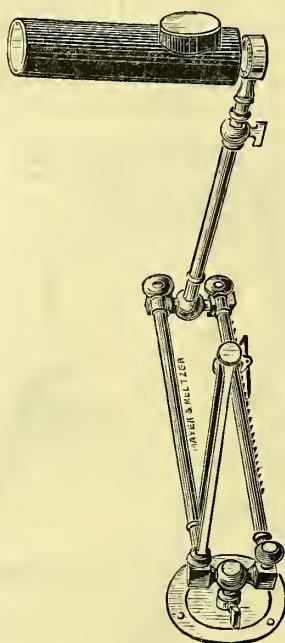


FIG. 25.—Rack Lamp—universal movement.

in a small portable case, $3\frac{1}{2}$ inches by $3\frac{1}{4}$, which holds a lamp and paraffin; the lamp, which, with a miniature bull's-eye burner, furnishes a beautiful clear light, can either be placed standing on a table, or held in the hand of an assistant. With it I have frequently made ophthalmoscopic and laryngoscopic examinations. It is, therefore, a most useful companion—in fact, almost an indispensable one—when we are summoned in a case of emergency to the country.

Figs. 23 and 24 show an elegant standing lamp of Maw's, which may be used for either gas or oil.

The electric photophore is most useful in the examination of the nasal fossa, as is also an admirable electric lamp for rhinoscopy of Messrs Mayer and Meltzer.¹

In introducing the speculum we must remember the great timidity that many patients exhibit on being examined. Hence it is that a light and gentle yet firm hand is required to conduct all aural manipulations. In many affections of the auricle and meatus there is super-

¹ See descriptions in the next chapter.

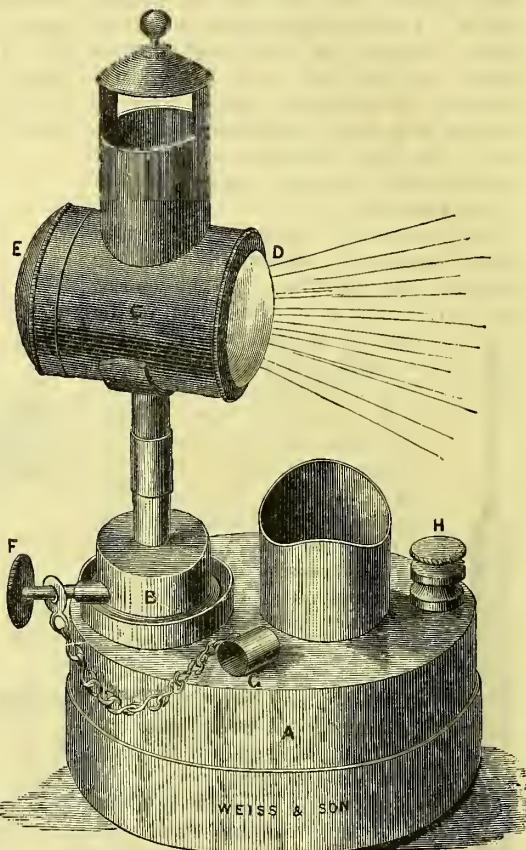


FIG. 26.—Portable Lamp.

handling of the ear a thing to be avoided as much as possible. Rough pulling of

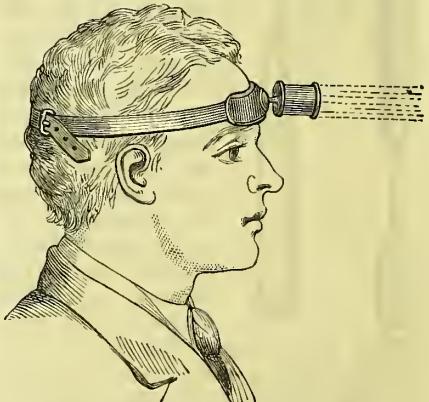


FIG. 27.—Photophore on Forehead, No. 1.

the auricle, or any forcible pushing of the speculum, is sure to be resisted by

the patient, who may thus be alarmed at any further interference. In any case of

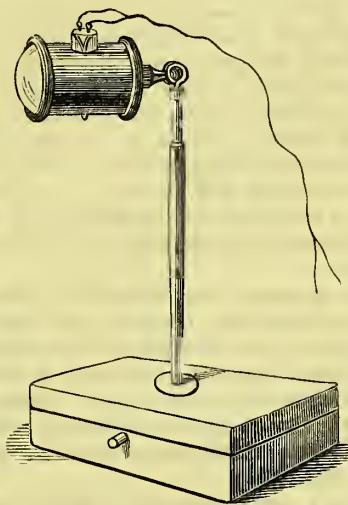


FIG. 28.—Photophore on Stand, No. 2.

aural affection all force or roughness in manipulation is to be deprecated. Those who cannot manipulate with gentleness had better not manipulate at all. A man's entire success with a patient will depend much on the confidence and ease with which he introduces the speculum or the Eustachian catheter; the infliction under any circumstances of unnecessary

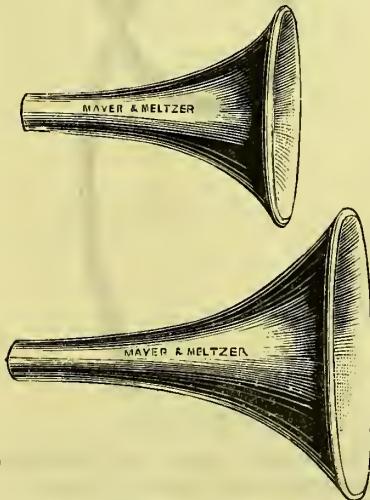


FIG. 29.—Aural Specula.

be secured by keeping constantly in mind, and strictly adhering to the resolution to *avoid all force*. It is to the careful carrying out of this principle that most men owe that delicacy of touch that comes from the constant treatment of all delicate and sensitive organs, such as the ear, eye, and urethra. No rough or awkward surgeon can ever be an aurist.

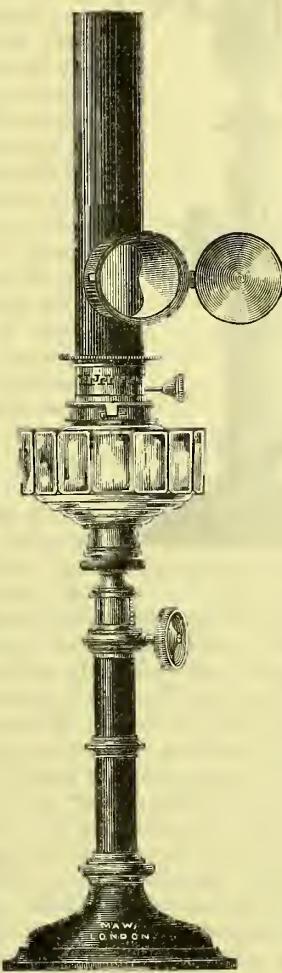


FIG. 30.—Bull's-Eye Lamp for Oil.

Different varieties of specula have been brought into notice since the time when Grüber and Wilde first introduced theirs to the notice of the profession.

For practical purposes, either that known as Toynbee's, or modifications of it, as Turner's, will be found quite sufficient. Some surgeons prefer a

pain should be avoided. This preliminary encouragement of the patient can only

speculum with an opening at the side to facilitate examination of the meatus

and for therapeutic purposes, or, as recommended by Hinton, a speculum with a small piece out of the end, in order that a more perfect view of the membrane may be obtained. I figure the kind of specula I prefer, and will only add that the utility of a speculum does not so much depend on its form or shape as on the hand that guides it. For children it is necessary to have a speculum with a small and, I prefer a circular end.

"In introducing the speculum," says Hinton, "it must be

remembered that (beginning from without) the meatus winds, first, a little forwards and then backwards, and slightly upwards, so that there is a tendency for the eye to fall on the wall of the meatus, instead of reaching the membrane; and the speculum accordingly must be introduced well into the passage and directed first a little forwards, for the ends and part, with a slight pressure on the outer part of the posterior wall to straighten the cartilaginous portion of the canal."

Having introduced the speculum well into the meatus, we note its shape and size, if narrowed and painful; if the dermis is congested or inflamed; if there is any discharge, and if so, its colour, nature, or smell; if there is a collection of cerumen which interferes with our view of the membrana tympani. If there is any pus or epithelium blocking up the meatus it must be carefully removed with the syringe, and the passage cleaned with a little cotton-wool rolled on the aural probe. The canal can then be

examined thoroughly for foreign bodies, polypi, molluscous or sebaceous tumours, aspergillus, exostoses, &c.

Weber-Liel has devised an ear microscope,¹ with these objects:—(1) To show distinctly the great magnified membrana tympani, and, in cases where a defect of the membrane exists, the part of the exposed cavity; (2) to demonstrate the oscillations of the membrane and malleus under normal and abnormal conditions, *i.e.*, to show not only morphological, but also functional alterations with a micrometer.

By its means the different excursions of the membrana tympani and ossicles are visible, and the power of motion in the former under the influence of different sounds or musical tones. Adhesions and rigidity of the membrane and ankylosed states of the ossicles are made more apparent.

I had the advantage of seeing some demonstrations by Dr Weber-Liel with

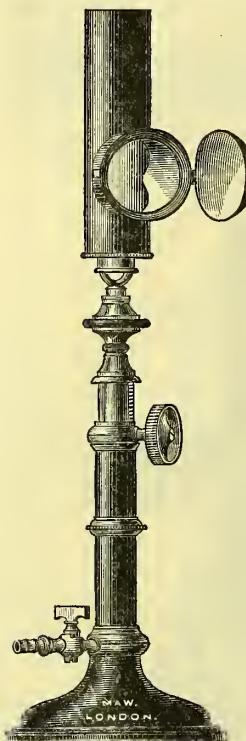


FIG. 31.—Bull's-Eye Lamp for Oil.

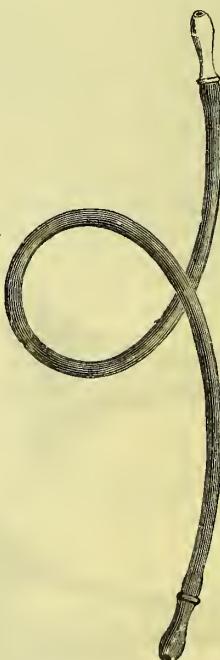


FIG. 32.—Otoscope.

this instrument, which most beautifully demonstrates the facts above noted.

We may now seek to satisfy ourselves on the following points:—(a) The ap-

¹ A full description of the ear microscope appeared in the second edition of this work.

pearance and position of the handle of the malleus, if drawn inwards and "shortened in perspective" (Tröltsch); if it appear unusually prominent or altogether displaced and dislocated from its natural position; if it is vascular and injected on the surface. (b) The cone, if present, its direction and degree of lustre; if it has lost its shape, or if there are two or more spots of light. (c) The general colour and appearance of the membrane itself; the degree of curvature, opacity, and thickening; the appearance of the manubrium, the umbo, and short process; their relative prominence, vascularity, and colour; the degree of mobility or flaccidity on inflation; the signs of any deposits, calcareous or otherwise; the presence of polypus; if there be pulsation, rupture, or perforation.

We detect the patient's power to inflate the membrane by means of the otoscope, and in a degree the response we get with it affords us an indication of the state of the tympanic cavity. This simple contrivance also enables us to arrive at a conclusion as to the perviousness of the Eustachian tube. The otoscope of Politzer is a simple india-rubber tube having a small vulcanite ear-piece fixed at either end. Three tubes may be had connected to a central hollow vulcanite ball (fig. 9). This form is convenient, as the patient can place a tube in each ear, and the result of the inflation of the two membranes can be quickly contrasted. It is also useful for teaching pur-

The mode of using the otoscope by resort to Valsalva's method of inflation is simple. The patient is desired to shut his mouth, and at the same time to hold his nose firmly, and then to blow (not too forcibly), when the air is at once heard with a gentle rustle impinging against the membrane. The previous insertion of the ordinary or pneumatic speculum when this is done will show the degree to which the patient can inflate the membrane. In the majority of cases we recognise the fact that air has entered the tympanum by an alteration in the shape of the membrane or any temporary obliteration of the cone of light. But there are extremes of rigidity or flaccidity, in which the drum is hardly affected, or it may be that it is blown out bladder-like, and yields abnormally to the force of the entering current. We sometimes get a peculiar moist gurgling sound of varying shades of intensity, denoting a moist state of the Eustachian tube, and probably an accumulation of mucus in the tympanic cavity. On the other hand, there is in many cases of old tympanic mischief a dry crackling sound, which accompanies flaccidity of the membrane, and which I have found present in long-standing cases of retained secretion. But familiarity with these various sounds is to be gained only from the constant use of the otoscope; they are to be learned not from description, but from practice. Gruber has drawn attention to the relative value of the secondary sounds which we hear during the recoil of the membrane and ossicles, &c. Though aware of the occurrence of these sounds, I have not observed any fact of practical importance in connection with them.

For further determining the presence of adhesions of the membrane and the mobility of the malleus, the pneumatic speculum first introduced by Siegle is very valuable. It consists (*vide* fig. 34) of an ordinary vulcanite speculum (*a*), which screws into a vulcanite box (*c*) covered with a glass lens (*b*), which is also screwed on. By placing a little piece of india-rubber tubing on the tubular part, it fits air-tight into the meatus. The box has an india-rubber tube and a mouth-piece (*d*) connected with it, which is placed in the mouth of the surgeon; suction is applied to the end of the tube, and the air drawn from

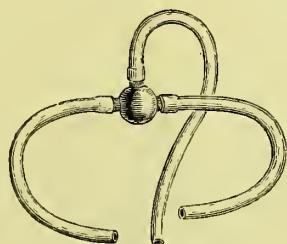


FIG. 33.—Otoscope.

poses, as, at the same time as the surgeon, a student can examine the ear with it. If the surgeon place a tube in either ear the intensity with which the sound is conveyed is increased, and the least inflation perceived. Double German otoscopes, on the principle of the double stethoscope of Scott Alison have been contrived.

the meatus, thus acting on the membrane, with a good light thrown on it through the speculum; the former is seen magnified, and any adhesions and inequalities which may exist are disclosed.

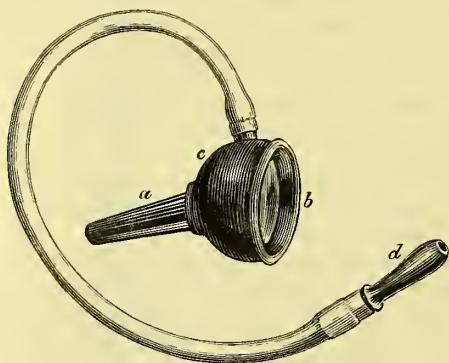


FIG. 34.—Siegle's Speculum.

But often with the speculum it is not easy to diagnose a pin-hole perforation or a slight rent or slit in the membrane. The presence of a minute particle of cerumen, a tiny blood-clot on the membrane, a small foreign body, an old scar, or the cicatrix of a healed perforation, may each be taken for a small perforation. We should on all occasions, when in doubt about perforation, confirm the diagnosis by inflating the ear. One end of the otoscope is placed in the surgeon's ear, and the other in the affected ear of the patient; the ear is inflated by the bag of Politzer, and if there be any aperture or chink the air whistles through it with the unmistakable sound of perforation. It is better in any ambiguous case not to arrive at a conclusion until the ear has been inflated.¹ The hearing distance should be noted after inflation, and compared with that recorded before this manœuvre was practised. In the great majority of cases, however, on fixing our eye well on the spot where we suspect an aperture, and throwing a good light on it through the speculum, we can see the small bubbles of air issuing from the perforation, or fluid oozing through it from the tympanum by Valsalva's inflation.

¹ See chapter on General Therapeutics for Politzer's Aural Bag, and Description of the Eustachian Catheter.

Sometimes the hole is covered by a bright bubble of air, the movement of which distinctly marks the vascular pulsation, and the glisten of which at once shows the seat of the perforation.

All deceptive appearances are discovered by the adoption of these two methods: first, by careful examination with the speculum and watching the suspicious spot on inflation; secondly, by the use of, especially in recent cases of perforation, the otoscope and Politzer's bag. Not alone may we see with the pneumatic speculum the smallest perforation, but we can recognise any adhesions that may have formed, binding the membrane to the inner wall of the cavity or to the stapes and promontory. The membrane may be thick and cartilaginous-looking, a condition frequently accompanying ankylosis of the bones (see chapter on Therapeutics). To examine a patient for perforation we must first carefully cleanse the meatus, and get a full and distinct view of the membrane. If the perforation is large there will be no difficulty in recognising its presence, the clean cut edges marking its size and position. In many instances the membrane is almost entirely absent, and then we get a view of the cavity of the tympanum, which occasionally has a granular appearance.

TUNING-FORK.

We now come to a most important step in the process of examination. The diagnosis of an obscure aural case is incomplete without the test of the tuning-fork. It is well to have at hand a few tuning-forks of various sizes and different keys.

It is not in keeping with the design of this work to enter into the various physiological and acoustic reasons which have been assigned for the fact that vibrations passing through the solid media (the bones of the head) in the normal state, are as a rule, intensified and the reflections increased when the external meatus is closed, and when those vibrations are prevented from escaping. Whether this obstruction is in the meatus or in the cavity of the tympanum, the effect is identical. Cerumen, a foreign body, polypus, obstruction from epithelium and hardened mucus in

the external passage, or accumulated mucus in the cavity of the tympanum, will produce a similar effect. This is not an absolute rule. There are persons whose hearing is very acute, and in whom

there are no symptoms of any abnormal conditions, who do not hear the tuning-fork louder on closure. Some time since, in trying the tuning-fork on the heads of some bystanders, and explaining the reasons for the use of the instrument in diagnosis, the accuracy of the theory received rather a blow, when, the first person (a student) on whose head it was placed for experiment, and one who had remarkably good hearing and had never had anything wrong with his ears, declared that he did not hear the tuning-fork louder on closure of the meatus, but, of the two, less so. I tried him several times with the same result. There was no cerumen, the membranes were healthy; all the bystanders were, however, influenced differently. This is not the

only time that this unusual result has been stated to me.

Nothing in the examination of the ear requires the exercise of so much patience as the trial with the tuning-fork. Each experiment should be repeated a few times, and the patient kept in ignorance of the result expected. Deaf patients, especially the poorer ones, are often intensely stupid. To arrive at a truthful conclusion, we must try their accuracy several times. It is a good plan to return to a previous step in the examination, and to repeat the question as to the intensity of the sound. Constantly, patients will at the same examination contradict assertions which a minute before they have made with the greatest confidence. I find it often at the hospital a trial not alone of the tuning-fork, but still more of my patience, to elicit the truth which they quite unintentionally obscure. I generally adopt the following method of testing, whether the deafness be unilateral or bilateral:—

1. Ascertain if the sound is heard

louder in either ear, the meatus of each remaining open.

2. If the sound is heard louder in either ear, or the contrary, the meatus of each having been closed alternately with the finger.

3. If the sound, as heard with the meatus of each ear closed, is louder as contrasted with its intensity when both ears are open. This I do by making the patient, with his thumbs, quickly close the ears on placing the tuning-fork on his head, and by testing him alternately with both the ears open and closed.

Let us take a few uncomplicated examples. We have by the speculum excluded any cause which can exist in the external meatus, such as cerumen, polypus, epidermis, or foreign body. We wish to arrive at a conclusion as to whether the deafness and tinnitus are due to tympanic obstruction or to disease in the labyrinth and of the auditory nerve.

First, a patient hears *badly in the right ear*, and well in the left. With the tuning-fork on the head in the first step of the examination, he hears it *loudest in the right ear*. The presumption is—*mucus in the cavity of the tympanum of that ear*. On closing the left ear the sound is intensified in it, equally, if not exceeding, that heard in the right one. On closing the right one the sound is not increased, as a rule. The diagnosis is confirmed in a majority of cases; it is one of obstruction in the cavity of the tympanum.

Secondly, a patient is *deaf in both ears*; the tuning-fork placed on the head is *heard loudly and equally in both*, and there is *no difference, or very slight, on closure of either meatus*. We may presume *mucus in the tympanum of each ear*.

Thirdly, a patient is *deaf in the right ear*; the tuning-fork placed on his head is *heard louder in the left ear*. We assume *nerve deafness of the right ear*. *On closing the left ear, the sound is intensified in it; on closing the right, there is no difference*. In my experience in the majority of cases it is, of the two, *less*. We confirm the assumption of nerve deafness in the right ear.

Fourthly, a patient comes to us *deaf in both ears*, with or without tinnitus. The

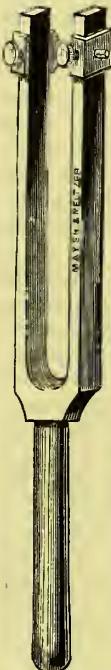


FIG. 35.—Aural Tuning-Fork.

tuning-fork placed on the head, *he hears perhaps badly, and the sound dies rapidly away.* This can be ascertained by testing him as usual, and transferring the fork quickly to the observer's head or teeth, on the patient's making a signal that the sound has disappeared. It is possible *he may not hear the tuning-fork at all* when placed on the head, and we must transfer it to the teeth before the vibrations are conveyed. Closure of either ear produces little difference (*Hinton thinks slightly increases the sound*); I am inclined to think more frequently lessens it. We diagnose *labyrinthine deafness of both ears.*

Such is, up to the present, the result of my experience in the majority of cases. On the disputed point of the patient hearing the sound less distinctly on closing the deaf ear (Roosa) in a case of uncomplicated nervine deafness, or its being slightly intensified (Hinton), after examining many hundreds of cases, I believe that the result is variable. Complications may exist which escape observation, and may be outside our power of diagnosis. Such complications existing in the tympanum, and which involve its membrane and ossicles, would influence the result. That they coexist frequently with nervine deafness is, of course, true, and hence it may be the case that much of the difficulty lies in this source of error.

Though the above rules as regard the diagnostic value of the tuning-fork are generally found to lead to a correct conclusion, still anomalous cases are constantly occurring in a large aural practice, and in the instance of very intelligent persons, which I do not pretend to account for, and which are more or less at variance with them.

In these cases I am inclined to believe the mischief in such persons is not confined to the cavity of the tympanum and the ossicles, but probably from the effects of long-retained secretion, low inflammatory states of the lining membranes, adhesion, and partial ankylosis of the bones have been produced, implicating the labyrinth and nerve. In such patients we find the membrane unyielding on inflation, no improvement in suction with the pneumatic speculum, and its concave and thickened appearance verifies the diagnosis.

PAST TREATMENT.

Before concluding the examination of any case, it is well to ascertain the nature of the treatment, if any, which has been previously adopted. This is particularly necessary in dealing with aural patients. In many instances it may be a guide to the prognosis that we give. It will also prevent the repetition of the employment of useless remedies, and save the patient from interference, which cannot do good, and which may do harm. In a large number of cases various empirical means have been already used to combat the pain or deafness, and it is advisable, both for the confidence of the patient and as a guide to the surgeon, that all information on these matters should be elicited before the treatment of a case is commenced. It should not be necessary to give any caution as to the judicious care which must be shown in asking information on such points. The reputation, the welfare, at times the character of a brother practitioner are in our hands; the man who, by look, word, or gesture, forgets the duty he owes that brother, through a base desire to advance his own interests at his expense, is unworthy of the position he holds as member of our profession.

Having now referred to the steps which it is necessary to take in making an examination, and the several points to

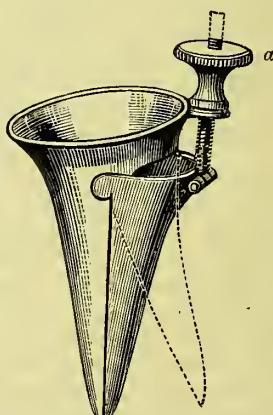


FIG. 36.—Nasal Speculum of Duplay.

which we must direct our attention, I next proceed to notice the instruments useful in diagnosis and treatment.

EXAMINATION OF THE MOUTH AND NASO-PHARYNX.

In arriving at a diagnosis, examination of the throat, and, if necessary, the posterior nasal passages, is essential in most affections of the middle ear. It is quite outside the object of this handbook to enter into any detailed descriptions of affections of the throat and nose. Such a description may be found in the classical and in the English language unrivalled treatise of Morell Mackenzie. It is absolutely necessary, however, to consider briefly those affections of the naso-pharynx in so far as they involve our diagnosis and treatment of the ear, and especially the middle ear.¹

As it must be necessary occasionally to practise rhinoscopy in the treatment of deafness, and as the manipulation of the laryngoscope is a less difficult one than that required for rhinoscopic examination, while the same reflector and illumination can be employed for both purposes, it follows that any practical aurist should first familiarise himself with the use of the laryngoscope. In every case we should place our patient opposite a good light, and, with a depressor getting the tongue well down, examine the state of the mucous membrane covering the soft palate,

uvula, tonsils, and pharynx. Frequently we may have only a congested condition of the pharyngeal membrane, and an ordinary catarrhal state, popularly called relaxed. This turgidity leads to temporary closure of the Eustachian tube, and is a frequent accompaniment of "cold in the head."

¹ Practitioners will find Dr Cresswell Baber's *Guide to the Examination of the Throat and Nose* (Lewis, London) invaluable.

MOUTH AND PHARYNX.

In this first examination we note the state of the tongue as indicative of the general health of the patient, or evidence it gives in any white patches or fissures of the presence of a syphilitic taint.

The colour of the mucous membrane covering the hard and soft palate,



FIG. 37.—Ordinary Laryngoscopic Mirror.

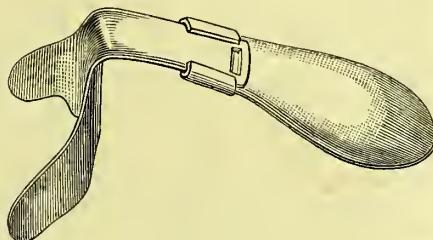


FIG. 38.—Convenient Lip and Cheek Retractor with Tongue Depressor combined (American).

whether it affords proof of a general anaemic condition, should be noted; we may, at the same time, observe the relative size, position, and appearance of

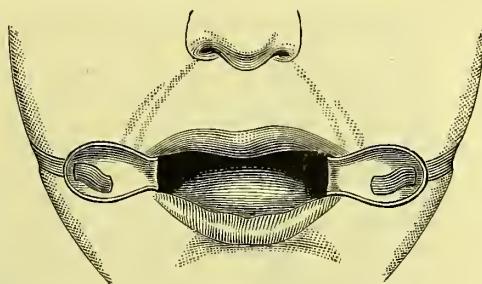


FIG. 39.—Cheek Retractor accompanying the above.

the tonsils, if enlarged, and the seat of follicular inflammation, the size of the uvula, and the depth of the space between the velum and the pharyngeal wall and its tonsils. Any discharge covering the pharynx, as, for example, the well-known slimy dark-brown or greenish-black tenacious discharge, which is the most characteristic feature

in old post-nasal catarrhal conditions, accompanied in ozænous states of the nares by a most unpleasant odour. An error in regard to this odour might readily be fallen into in some cases. A lady, some little time since, consulted me for what she thought was an unpleasant smell coming from her nose, and for which she had been locally treated. On examination I found that though the mucous membrane of the pharyngeal wall was somewhat dry and glazed, there was no evidence of retained secretion, or any post-nasal discharge. Still a most offensive odour was present with the breath. By making her breathe lightly through the nostrils, with the mouth closed, I found there was no smell ; on her breathing entirely through the mouth, it was present as before. A course of papaine, with permanganate of potash and peptones, and careful regulation of the diet, in a short time cured this most offensive symptom of gastric derangement and dyspepsia. During the general survey, we may be directed to a paretic source of the deafness by alteration in the natural position of the uvula, or the palatal arches, the form of which, in consequence of one-sided paresis of the palate muscles, may be drawn to the side, the latter drooping and occupying a lower level than in the normal state.

ANTERIOR AND POSTERIOR RHINOSCOPY.

In examining the anterior nares, the patient should be placed so that the light may be thrown well into the nostrils by the aid of the spectacle reflector. Sunlight, where possible, is to be preferred. Otherwise the Argand burner, with the bull's-eye lens, gives an admirable light. Trouve's electric photophore is an incandescent lamp of from eight to ten candle-power ; it is fitted to the forehead by a head-band, which is fixed to a plate by a ball-and-socket joint. It may also be used on a stand.¹

The battery employed to light the lamp is made of zinc and carbon, and is worked with the bichromate solution.

¹ For full particulars of this lamp, see note by Cresswell Baber, *Brit. Med. Journal*, November 10, 1883, and *Guide to Examination of the Nose*, p. 63 ; also pamphlet by Armand Levy, 20 Chiswell Street, London, E.C. See figs. 27 and 28, pages 46, 47.

We may thus summarise the points to which attention should specially be

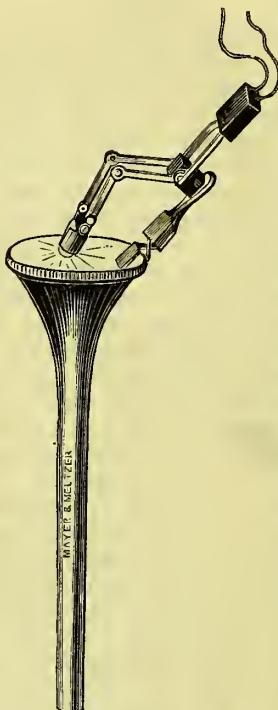


FIG. 40.—Electric Lamp applied to Zanfel's Nasal Speculum for examination of the Nasal Fossa.

directed in the examination of the naso-pharynx.

THE NOSE.

We should inquire into the presence of any discharge—examining its character and nature—if there be obstruction in either nasal passage, and its cause, if the pronunciation be affected, and sleep altered or interfered with. This preliminary inquiry will necessitate a careful examination, after removal of any discharge, of the anterior nares, the inferior and middle meatus, the turbinated bones, and the septum. We note any deflection of the nose, either the result of injury or congenital ; we examine with a flexible silver probe, or protected aural

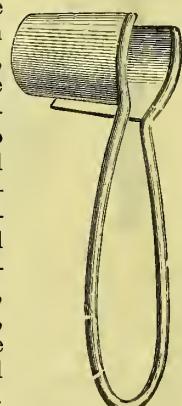


FIG. 41.—Thudichum's Nasal Speculum.

probe and nasal bougie, the septum and turbinated bones, and the perviousness of

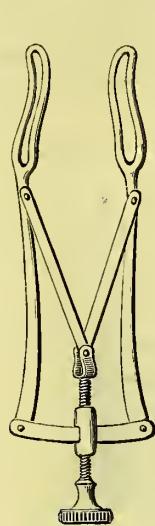


FIG. 42.—Fraenkel's Nasal Speculum.

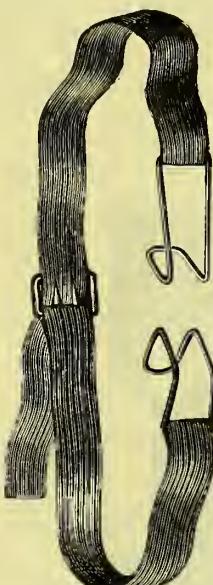


FIG. 43.—Cresswell Baber's Nasal Retractor.

the nasal passage. The appearance of the mucous membrane of the middle

the septum must be generally noted. A little practice will enable the surgeon readily to recognise hypertrophic conditions and abnormalities of the turbinated bones from polypus and other growths, while the concavity, on one side corresponding to the convexity in the obstructed nostril, when we examine both surfaces of the septum with a probe, will decide any doubt between deviation and growth of the septum.

POSTERIOR RHINOSCOPY.

For examining the posterior nares the following instruments are required:—A few small rhinoscopic mirrors, which can be introduced into the ordinary laryngeal handle, a uvula hook, or the uvula noose of Voltolini, the uvula twitch of Mackenzie, or, in the want of these, two pieces of string, stiffened at the ends with mucilage; a laryngeal reflector, a tongue spatula. The rhinoscopic mirror should resemble the laryngeal mirror in shape, but its reflecting surface should not be more than five-eighths of an inch in diameter, and it should be fixed to its shank at a right angle. The spatula may mostly be dispensed with.



FIG. 44.—Baber's Nasal Retractor Applied.

and inferior turbinated bone, any hypertrophic conditions of these bodies, the presence of growths in the meatus, especially the middle, and any deflection of

The examination should be conducted as follows:—The lamp should have the same position as in laryngoscopy, but the practitioner in using the reflector must



FIG. 45.—Rhinoscopic Mirror (Zaufal).

throw the rays lower in the fauces. The patient being directed to sit with the head erect, and to open his mouth widely, the tongue is pressed forward and downward with the shank of the mirror, or with Cresswell Baber's finger depressor,

somewhat, most frequently towards the left side. Projecting from the outer wall on each side, and extending inwards towards the septum, the middle turbinate bones are seen covered with pale mucous membrane, and somewhat re-

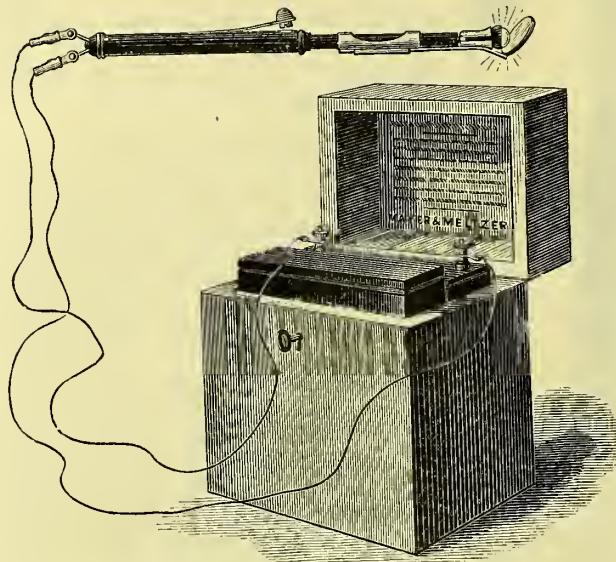


FIG. 46.—Electric Rhinoscopic Mirror, same Battery as that used for the Nasal Speculum.



FIG. 47.—Cresswell Baber's Finger Depressor (Wright).

and the mirror is introduced to the back of the throat, so that the plane of the reflecting surface forms with the horizon an angle of about 135° . If the uvula is drawn upwards and backwards, the patient must be directed to expire gently, and continue to produce some nasal sound. Straining and forced inspiration must be especially avoided. The practitioner will find it a good plan to introduce the small mirror between the anterior pillar and the uvula on one side first, and then to withdraw it and introduce it again in the same manner on the opposite side. In this way the posterior nares will be seen, and by slanting the mirror first to the one side and then to the other, the orifices of the Eustachian tubes will become visible. It is seldom that the whole of the posterior nares can be viewed with the mirror, as the soft palate generally eclipses the lower third.

In the middle line is seen the septum covered with thin mucous membrane, through which the bony edge shows white and sharp. It usually slants

somewhat, most frequently towards the left side. Projecting from the outer wall on each side, and extending inwards towards the septum, the middle turbinate bones are seen covered with pale mucous membrane, and somewhat re-sounding polypi, for which they have sometimes been mistaken. The superior turbinate bones are indistinctly seen as narrow projections of somewhat triangular shape, the apex appearing to extend downward, inward, and backward. At the bottom of the nasal fossæ are seen the inferior turbinate bones as two pale, roundish, solid-looking tumours. They do not project so far towards the septum as the middle bones. On each side of the inferior bones, though farther back, and in a different plane, are the Eustachian orifices; they appear as two irregular openings looking downward and outward.

In examination of the posterior nares the principal difficulty we have to contend with is the length and breadth of the uvula, and the shortness of the distance between the anterior pillars of the fauces and the posterior wall of the pharynx. The former obstacle may be in some measure overcome by attention to the hints given above as to breathing, or, in those cases in which these plans are

not successful, by trying the manœuvre of Wales by passing a string, stiffened with mucilage at one end, or a piece of fine rubber tubing through each nostril, next seizing the ends below the soft palate with a forceps, and, on drawing them through the mouth, tying them in

front, or giving them to an assistant. When traction is made on the strings, the velum can be drawn forward to any extent we please. Or the uvula twitch of Mackenzie may be used to seize the uvula, and draw it forward, or the palate hook of Voltolini. But all these methods at times fail, either from the unwillingness of the patient to submit to examination, or from the closeness of the soft palate to the pharyngeal wall. At best we can get, at any one moment, only a partial view of the posterior nares, and must reintroduce and shift the mirror in different directions, and from side to side, to ascertain what is the condition of all the parts seen by the post-rhinal method.

In the case of patients in whom the soft palate lies quite close to the pharyngeal tonsil, posterior rhinoscopy may be quite impracticable. The facility of examination in sensitive persons may be increased by spraying the pharynx with cocaine before the introduction of the mirror.

Palpation.—But in young children frequently we cannot avail of the rhinoscopic mirror. This is of more consequence since we have come to recognise, thanks to Löwenberg and Meyer, the relation which adenoid tumours of the naso-pharynx hold to deafness and imperfect nasal respiration. In such cases we may gain all the information we require by palpation.¹

The method of palpation is as follows:—The index finger, bent, with the dorsal surface downwards, is introduced into the mouth, and hooked round the soft palate. Having reached the naso-pharynx

geal cavity, the soft point of the finger explores successively the posterior openings of the nasal fossa, the lateral and superior surfaces of the pharynx, the entrances to the Eustachian tubes, and the postero-superior surface of the soft palate. We must “*cito tuto et jucunde*,” proceed with rapidity and gentleness, in order to ensure the absence of pain and nausea. Much delicacy and lightness of touch are necessary, especially when we are examining a soft palate, which is easily irritated and much enlarged. This latter difficulty, though less frequently than some believe, often interferes with digital examination in addition to the reflex movements caused by the contact of the finger with these sensitive parts.

The patient is directed to breathe by the nose, at the same time keeping the mouth open; we then carry the finger, at the proper moment, round the soft palate. To avoid giving pain, the nail of the exploring finger should be cut closely, and carefully filed to remove all the edge.

Löwenberg remarks that the direction to bend the head forwards intended to facilitate rhinoscopic examination, has been tried by him for digital exploration also, but he finds that in neither of these cases does it attain the object proposed, and for this reason—that the head, when bent forwards, is brought nearer to the anterior surface of the vertebral column, and that thus the dimensions of the naso-pharynx are considerably diminished from before backwards in the antero-posterior diameter. He thinks it better to direct the patient to incline the thorax forwards and the head backwards; by these means we get the widest space between the soft palate and the back of the throat; at the same time we secure the greatest distance from the surfaces of the cervical vertebrae, thus gaining as much space as the anatomical relations of these latter with the cranium will allow.

Digital examination thus enables us to judge of the condition of the posterior and superior walls and the lateral regions of the pharynx—a result which it is more difficult to obtain by the rhinoscope. The finger gives us the parts in their relative position, as they really are, while, when reflected in the mirror, they necessarily appear foreshortened,

FIG. 48.—MacKenzie's Uvula Twitch.



¹ I adhere here to the method of palpation described in Löwenberg's brochure on adenoid growths, translated by the writer in 1879 (*Med. Press and Circular*).

and not, as they are normally, in relation to one another. Palpation also shows us whether growths are soft or hard—an important distinction when considering the treatment to be adopted. This method of examination is the more valuable, since it always succeeds at the first trial, and consequently gives immediate results, which we might not obtain for a long time with the rhinoscope, enabling us to ascertain the presence or absence of growths, their site, their dimensions, their shape, and often their insertion, while the rhinoscopic mirror, if we can also use it, shows the condition of the mucous membrane, its colour, and the nature of its secretions, and with its assistance we can examine deeply into the nasal fossa, learning with greater certainty than by palpation the existence of small tumours. We should then, so far as it is possible, when we suspect the presence of adenoid growth and post-nasal obstruction, employ both methods, the patience exercised will be more than recompensed by the accuracy of the diagnosis, and the possibility thus acquired of radically curing the affection.

The laryngeal brushes of Mackenzie

are indispensable in the treatment of the throat and naso-pharynx. They can

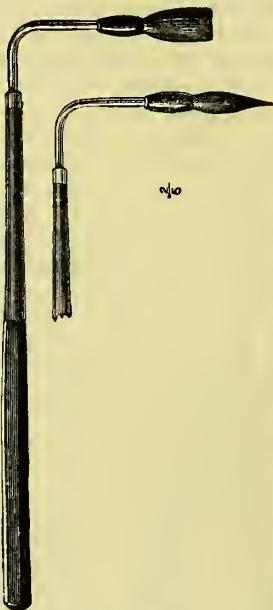


FIG. 49.—Laryngeal Brushes.*

be curved to apply behind the soft palate, and to the posterior nares.

CHAPTER VIII.

GENERAL THERAPEUTICS.

INFLATION OF THE TYMPANUM BY POLITZER'S METHOD—POLITZER'S AURAL BAG—AUTHOR'S BAG—GRUBER'S METHOD—CHLORIDE OF AMMONIA INHALERS—EUSTACHIAN CATHETER, USE OF—METHOD OF PASSING WEBER-LIEL'S TYMPANIC CATHETER AND KONIONTRON.

THE action of the muscles of the soft palate in opening the Eustachian tube during the act of swallowing has been already described (Chap. V.). It is during the end of the second act of deglutition and the commencement of the third that the separation between the upper and lower parts of the pharynx is effected. The tongue is then pressed against the posterior portion of the hard palate, the soft palate being carried upwards and backwards.

Gruber thinks this the most favourable moment for inflation by Politzer's method. Lucae's view, on the other

hand, would lead us to believe that the ear can be best inflated during the third act of deglutition. From repeatedly trying with my bag for auto-inflation, a very gentle compression of which, made lightly during the act of swallowing some saliva, is sufficient to inflate the tympanum, I believe that inflation by Politzer's method is best secured by beginning compression of the hand-bag just at the conclusion of the second act, and when the tongue is most forcibly compressed against the hard palate.

I employ two forms of Politzer's bag. One is the original bag of Politzer (Messrs

Matthews, London), which I use in ordinary practice; the other is a modification of one suggested by Löwenberg, and which I recommend to patients for auto-inflation. I prefer to cover the nozzle of the bag with a piece of rubber tubing, but it may be had with the longer tube and olive-shaped nose-piece of Weber-Liel. These bags should have an inlet valve. The following is the method of using it:—The patient is given a little water to hold in the mouth, and he is made to incline his head a little to one

movement which will cause the velum palate to hermetically close the nasopharyngeal space. "Such a process may be effected by a prolonged phonation of the vowel *a*, best pronounced in a nasal tone, which will cause the velum to rise, cut off the upper from the lower pharynx, and during this act air may be blown into the nares, and thence into the middle ear, by a powerful inflation with the hand-balloon." It will be found in many persons that the ear is easily inflated during this act, and if so, in a much simpler manner than by the process of swallowing water. In some, however, this plan of Lucae fails. It is well to try both methods in those cases in which there appears to be a difficulty of inflating the tympanum. Nor in some cases where we suspect liquid accumulation in the tympanum should Politzer's suggestion be forgotten, as it will be found more effectual, and may remove the serous collection. This is to give the patient a little water to keep in the mouth, and direct him to hold the head forwards and slightly to one side, and then, after the head has been held in this position for a minute, to inflate during the swallowing of the water. The tubal orifice thus opened permits the fluid secretion



FIG. 50.—Politzer's Bag Applied.

side. In the floor of the corresponding nostril to that of the ear it may be our wish more forcibly to inflate, we introduce the tube or nozzle in a horizontal direction. The head is inclined from the same side, the nostril being upturned. If both ears are equally affected, it is better alternately to inflate through either nostril. The surgeon now firmly closes the nostrils with the thumb and index finger of the disengaged hand, at the same time that he retains in position the nozzle or tube. The patient is now desired to swallow (the process having been previously explained to him, if an adult), and immediately (as the larynx commences to rise with the hyoid bone), as the fluid is passing into the pharynx, the bag is forcibly compressed, and the air rushes into the tympanum.

There is no difficulty whatever in carrying out this simple manœuvre, and even children get quite accustomed to the inflation if in the first attempts they are taken gently and gradually taught. This I believe to be far the best method of using the air douche.

Lucae has found that we may blow air into the middle ear by employing a

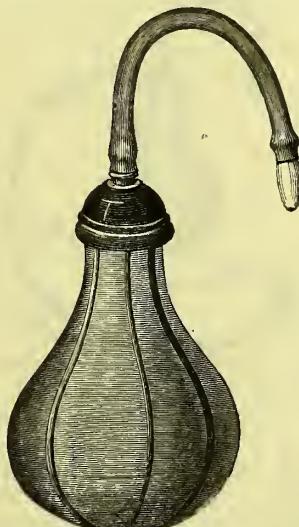


FIG. 51.—Politzer's Bag for Insufflation.

to pass out, and the position in which the head is held favours the passage of it in the direction of the Eustachian tube.

Gruber, seeing that the tongue is pushed further back during the pronunciation of the consonants *h* and *k*, suggested that inflation should be practised while the patient pronounces the syllables "hick," "hock." The operator "sits in front of the patient, and the end of the nozzle of the syringe (the ball of which is held in one of the operator's hands) is passed to the depth of one-third of an inch into the nasal opening. The operator then, with the thumb and first finger of the other hand, closes the opening around the syringe nozzle most carefully, and while the patient utters one of the prescribed syllables ('hack,' 'heck,' 'hick,' 'hock,' 'huck,' 'hek'), the ball is compressed, and the air flows with a clearly perceptible noise through the tubes into the tympanic cavity."

He claims for this plan (which are equally well effected by Lucae's) these advantages — (1) simplicity, (2) the avoidance of swallowing water in the act of deglutition, (3) a more prolonged inflation, (4) it is better adapted for self-treatment.

The other bag I employ is a modification of Politzer's bag, and of one devised by Löwenberg, to permit of the inflation either of respiration air or of any

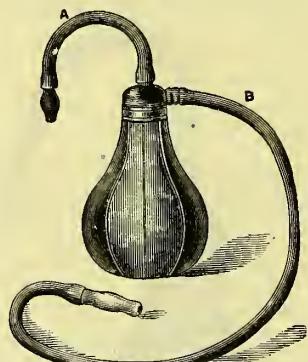


FIG. 52.—Aural Bag of Author for Auto-Inflation.

vapour into the tympanum. It is also the best bag for auto-inflation I know of. The bag is one I have contrived. Ball valves are placed at the entrance of the side (B) and nasal tubes (A). By compressing the bag, and blowing into the side tube, it is filled with warmer and heavier air than the ordinary atmospheric air (Löwenberg). Besides, as Löwenberg has pointed out, a greater interchange of gases is likely to take place when such

air reaches the tympanum, than in the case of the ordinary atmospheric air. By a few alternate inflations (through the side tube into the bag) and acts of compression, the bag is filled with air at the temperature of that in the lungs. The person wishing to inflate, places with the thumb and middle finger of the left hand the vulcanite nose-piece (which can be had in three sizes) in either nostril, closing the other with the forefinger of the same hand. By a sharp act of compression made with the right hand he drives the air forcibly in the open or partly open Eustachian tube just at the commencement of the second act of deglutition. Any surgeon trying this bag in the manner described on himself, will find how effectual it is, and that the simple attempt to swallow a little saliva is quite sufficient without taking any water into the mouth. I do not think, for the use of the surgeon and for diagnostic purposes, it is as powerful an inflator as the ordinary Politzer's bag, but it is quite powerful enough for any patient to use, and is more easily managed. Also, with this bag, if we wish to add any particular vapour to the air to inflate the tympanum with, we can do so. In this way the patient can inflate his own ear with nascent chloride of ammonium vapour or that of iodine. By attaching the side tube, as shown in the drawing, to the small tube of a Kerr's inhaler, the bag

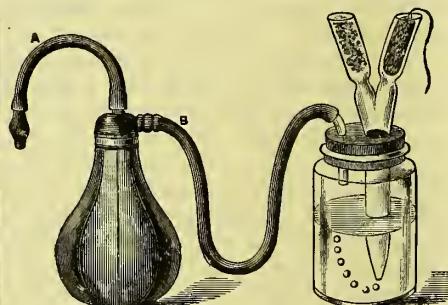


FIG. 53.—Aural Bag of Author attached to Kerr's Inhaler.

can be filled as described in the instance of the respiration air, and the chloride of ammonium vapour can be inflated. By compressing the bag the vapour is drawn into it, and when it is thus filled the side tube can be removed from the inhaler during the act of inflation. I can thoroughly recommend this bag, when

properly made, for auto-inflation and also for the surgeon's use. To add iodine vapour we must place in the Kerr's inhaler some vapor iodi; in like manner both oil of turpentine and chloroform may be used, or these may be conveyed on the chloride of ammonia vapour.

This bag is well made by Messrs Maw, Son, & Thompson. There is a small chloride of ammonium inhaler ("the Amuriagen"),

which is of a very convenient size and portable. The aural bag can be filled from it, and several other vapours may be inflated. Messrs Allen Hanbury have rather improved the bag by substituting conical

FIG. 54.—S, Sponge; A, pumice (instead of asbestos originally used). (Messrs Allen Hanbury.)

the best chloride of ammonium inhaler for the surgeon's study is that of Messrs Burroughs and Welcome, as it furnishes a continuous supply of the vapour, and is always ready for use.

It is better that the surgeon for a few occasions should freely Politzerise a patient. He will often be surprised at the marvellous improvement in the hearing, and the decrease in the intensity of the tinnitus, which follow from this simple step. He should remember the position and direction of the Eustachian orifice. The nozzle of the ordinary bag when inserted in the nostril (and for very forcible inflation I prefer the rubber tubing which can pass about an inch along the floor of the nostril) should be directed horizontally; the patient is placed sitting; the act of compression should occur just as the hyoid bone is rising in preparation for the second act of deglutition. The patient can most effectually sustain the good effect by using my bag at home. This he can do once daily at first, and at less frequent intervals subsequently. He will find that much of the "magic" of the aurist's art rests in this simple but

successful trick of inflation, the suggestion of which we owe to Politzer.

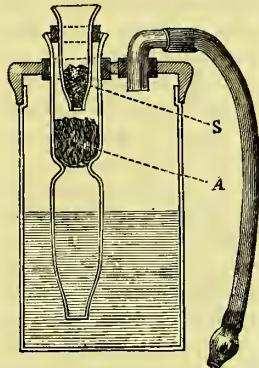


FIG. 55.—Keene's Inflating Bag.

EUSTACHIAN CATHETER.

It is essential that all who would treat aural cases successfully should become dexterous in the use of the catheter. Catheterisation is essential in therapeutical application to the middle ear, in overcoming Eustachian obstruction to inflation. In the diagnosis and prognosis of middle ear affections, students should not neglect to learn the method of using the instrument any more than they do that of the urethral one. Awkwardness is as hurtful, and gentleness combined with delicacy of touch as indispensable, in the urethral operation as in that on the Eustachian tube. Indeed, so far as the passage of the instrument is concerned, I believe more injury and pain are likely to be inflicted on the delicate and sensitive urethra than on the nose and nasopharynx. On one occasion, and that comparatively recently, the beak of a small catheter caught in the cartilaginous portion of the Eustachian tube, and I had some difficulty in removing it. I frightened my patient, rather a fidgety one, away. After a use, almost daily, of the Eustachian catheter for seventeen

years, I have never, with this exception, had an untoward result follow its employment. Gentleness and avoidance of all force are the essentials to success. With these precautions I cannot conceive the catheter doing any harm. Taking these, any surgeon should be able to pass it with facility. The errors which I have seen generally committed by beginners are these:—The catheter is taken hold of in too clumsy a manner, and held too firmly during its introduction; it is introduced too slowly, and carried into the middle meatus instead of the inferior; it is not passed far enough back, or is turned towards the ear, anterior to the orifice of the tube; on the other hand, it may be passed back to the pharynx, and not drawn sufficiently forwards, thereby being turned into the fossa of Rosenmüller behind the faucial orifice of the tube. The essentials to success are—a thorough knowledge of the situation of the opening; a light hold of the instrument, which we introduce with the forefinger and thumb of *either* hand; the beak of the catheter should be directed well downwards, and glided along the floor of the nares, avoiding the turbinated bone; tact in not turning the point into the fossa posterior to the pharyngeal orifice of the tube.

It is of importance to be able to pass the catheter with either hand with facility. Frequently a patient, just as he finds the sensitive anterior part of the nose touched by the catheter, raises his hand to catch the operator's. It is well to have the left hand in readiness, so that while we restrain the patient with the right, we continue quickly the passage of the catheter with the left hand, which we transfer to it.

I use a smaller catheter than that generally sold, for children, and a very

fine one, in cases of obstruction. It will be found useful to have catheters of various sizes and curves ready at hand. Both vulcanite and silver instruments can be curved to suit each case (I prefer the latter), the former being first placed in a little hot water to soften them. It is a matter for surprise that so many surgeons still fear to practise catheterisation of the Eustachian tube. It is true that it requires some little experience to introduce the instrument with ease and celerity; but with ordinary care and tact no harm can be inflicted in its passage, and there is nothing in the operation which a little practice will not enable every one who possesses any manipulative skill to overcome.

By such a bellows as that shown in the drawing, or by attaching the nozzle of Politzer's bag with a piece of tubing to the catheter, we can inflate the tympanum and ascertain that the catheter has entered the tube. A larger bag, having a valve and a tube furnished with a nozzle which accurately fits the catheter, is necessary for more forcible inflation through the catheter. The use of the larger balloon or of Politzer's bag for this purpose I do not recommend in ordinary practice. Any forcible inflation with this more powerful bag may do harm, and if the catheter be not accurately passed into the Eustachian canal air may be driven into the cellular tissue, and serious results follow. But

my experience generally is that free

FIG. 57.—Bellows attached to Catheter.

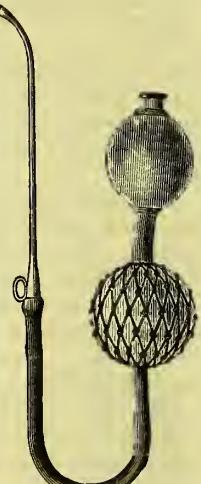
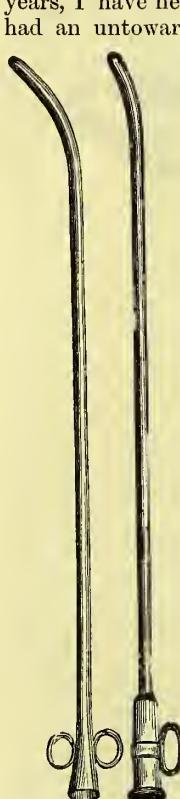
Politzerisation in the great majority of cases is the most effectual method of inflating the tympanic cavity, and that it is rare for inflation by the catheter to do much good where it fails. This remark does not apply to cases of stricture or closure of the tubal wall from tumefaction of the mucous membrane, in which cases we may have to force the walls apart by warm injections through

FIG. 56.—Eustachian Catheter.

Catheter.

It is of importance to be able to pass the catheter with either hand with facility. Frequently a patient, just as he finds the sensitive anterior part of the nose touched by the catheter, raises his hand to catch the operator's. It is well to have the left hand in readiness, so that while we restrain the patient with the right, we continue quickly the passage of the catheter with the left hand, which we transfer to it.

I use a smaller catheter than that generally sold, for children, and a very



the catheter both after and previous to Politzer's inflation. Here the greatest benefit is derived from the use of the catheter. In these cases also it is that, by passing a fine bougie through the catheter into the Eustachian tube, we succeed in opening the tube, and the subsequent inflation is more effectually secured. The bougie should be marked to indicate the degree of its protrusion from the catheter; the end of the bougie may be medicated by dipping it in any

versd, at a right angle to the nose, on a line with the floor of the meatus, the back of the hand being turned upwards, the beak of the catheter is introduced at the inner side of the corresponding nostril. The catheter, kept close by the septum, is carried for a short distance backwards, when the hand is brought down, the direction of the catheter being gradually changed to that of the horizontal one maintained in passing the ordinary catheter. With a sweep it is

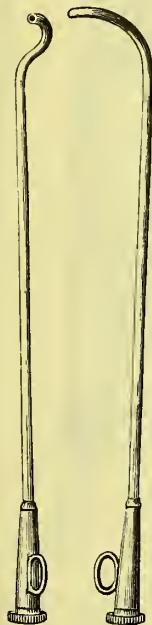


FIG. 58.—Noyes' Eustachian Catheter.

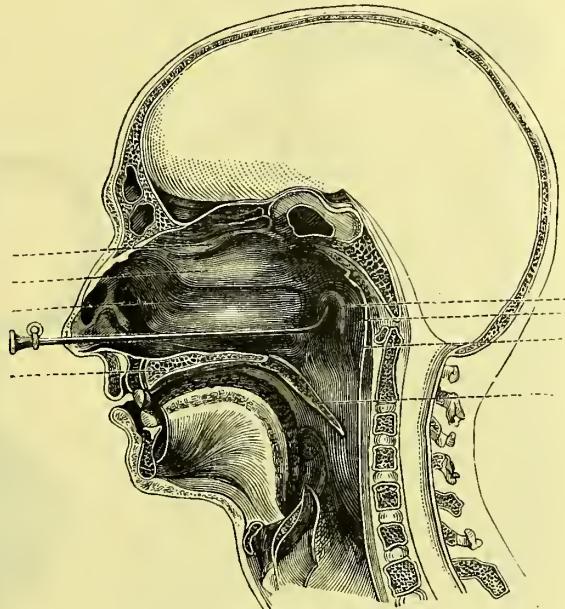


FIG. 59.—Eustachian Catheter in Position (Politzer).

solution, and allowing it to dry on it, as nitrate of silver, sulphate of zinc, chloride of zinc.

The double-curved catheters, first devised by Noyes, and passed from the opposite nostril in a case where there is an abnormality in the vomer or turbinate bone, or an obstruction in the nasal passage of the side corresponding to the affected ear, I find occasionally very useful.

It is a catheter with a double curve for the right and left Eustachian tube (fig. 58), and enables us as a rule to disregard those obstacles of the septum and vomer, which prevent the passage of the instrument. The catheter is held in the right hand for the right nostril, and *vice*

carried round the septum posteriorly, and then rotated inwards, the point readily entering the Eustachian tube of the opposite ear.

I have been using these instruments of Dr Noyes for a considerable time, and I am constantly enabled with them to catheterise cases which would prove very troublesome, if not impossible, to manage without their assistance. The catheter being in the tube, the otoscope, one end of which has been previously fixed in the affected ear of the patient, has now the other end placed in the ear of the surgeon, and by means of the insufflator bellows of Politzer's bag, the tympanum is inflated. Air is heard as if it were blown directly through the otoscope to the surgeon's

ear. (The annexed figure shows the insufflator and catheter.) I have for some time past been in the habit of employing the instrument depicted in fig. 62, kindly sent to me by Dr Turnbull of Philadelphia. It is a forceps which I find extremely useful for wiping the faecal orifice of the tube, and clearing away

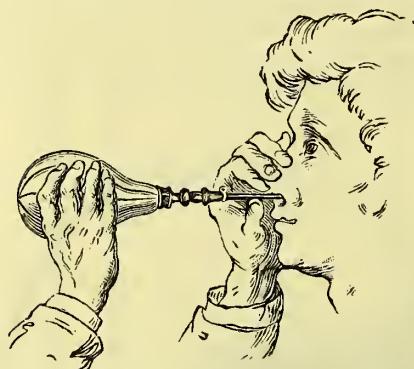


FIG. 60.—Balloon and Catheter in Position (Politzer).

any collections of mucus, &c., which may obstruct the orifice. I now make it a practice in those cases where I find a difficulty in passing the catheter, to mop out well with the forceps the part about the opening of the Eustachian tube with a small portion of cotton-wool, wet with some soda solution and glycerine, previous to introducing the instrument.

In some persons, where the nostril is sensitive, tender, or obstructed, I find it useful to pass a soft bulbous bougie, well oiled, once or twice before introducing the catheter. A patient on whom the catheter has been a few times passed can tell immediately when the tube is entered and the membrane inflated. Such persons, who are accustomed to the instrument, are the best for beginners to examine, as they are less sensitive, bear the operation well, and can at once tell when it is successfully performed.

Before passing water through the ear and Eustachian tube, in cases of perforation, when we wish to wash out the tympanum, it is of importance to place the patient in a sitting posture, for here also we are likely to produce a sense of reeling and giddiness. The imprudence of using any instruments, throat, or ear, which have been used promiscuously with several patients, or at any time after any suspicious case, or where there has been discharge, without first

thoroughly cleansing such by dipping them into boiling water, absolute alcohol, or some disinfectant solution, is obvious. It is unfair to the patient, and lays the medical man open to the charge of being the cause of transmitting a disease. The secret in using the Eustachian catheter is gentleness combined with patience. The catheter should be in the Eustachian

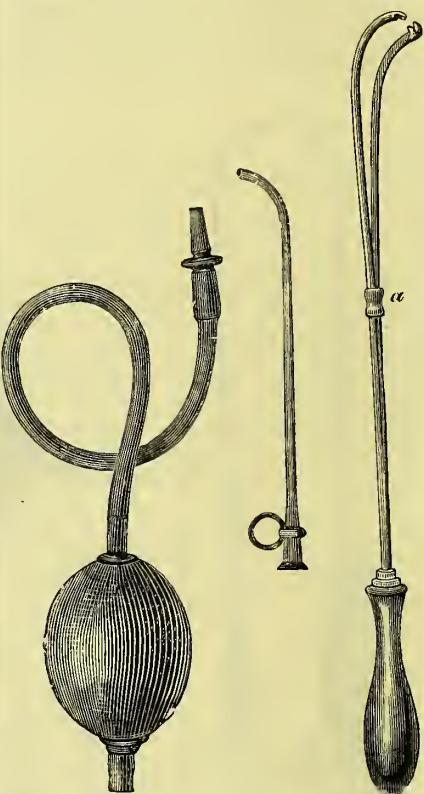


FIG. 61.—Insufflator and Catheter.

FIG. 62.—
Turnbull's
Eustachian
Forceps.

tube almost as soon as the patient becomes aware of your intention to introduce it. I now give the description of the best method of introducing the Eustachian catheter. The plan is that which is generally adopted, and is a combination of the methods recommended by Krämer, Tröltzsch, Politzer, Löwenberg, and Hinton.

The catheter, held lightly between the forefinger and thumb of the right hand, the left being in readiness to transfer to it, has its curved point directed downwards, introduced into the nostril; the hand being then raised, the

catheter is carried lightly and quickly (unless there be any obstruction) horizontally along the floor of the nares, all force being avoided, until the pharynx is touched posteriorly. The instrument is then drawn gently forwards, about half an inch, at the same time that it is rotated upwards and outwards, until we know by the direction of the ring on the outer end that it is turned towards the ear. It is then felt in the tube, having

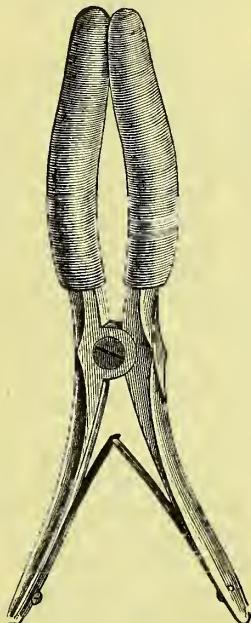


FIG. 63.—Bonnafont's Self-Retaining Catheter-Holder.

ridden over the posterior lip, and we verify the success of the operation by inflation with the Eustachian bellows. Löwenberg and Politzer recommend a plan which it is well sometimes to adopt if we miss the orifice, namely, to turn the catheter in, withdrawing it from the pharynx inwards, with its point in a direction downwards, until we feel it against the septum, and then by rotating the catheter outwards and upwards, to turn it towards the Eustachian tube.

The surgeon may fall into error from two causes with regard to air entering the tympanic cavity when he listens to inflation with the otoscope. He may think the catheter is in the Eustachian tube when its beak is only in the neighbourhood of the tubal orifice, and hence that air is entering the tympanum on in-

flation when it is not; or a more likely error, he may insert the catheter correctly, yet air may not pass beyond the wide part of the tube. The false sound produced, in the first instance, may be learned by any one with the Eustachian bellows and catheter. The sound reaching the surgeon's ear in the second case is far more distant, and altogether distinct from the characteristic rush of air heard when it directly enters into the tympanic cavity.

The careless or rough passage of the catheter, followed by too powerful an inflation, may lead to laceration of the mucous membrane and emphysema of the cellular tissue of the pharynx, and parts about the larynx, or, as proved by Voltolini, to pneumo-thorax and consequent collapse of the lung. Such an accident can only result from the employment of unjustifiable force or the reckless use of the handbag in inflation.

Dr Weber-Liel first introduced, in certain cases of obsti-

FIG. 65.—Tympanic Catheter.

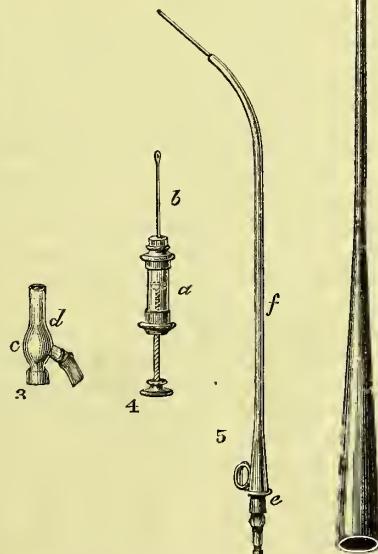


FIG. 64.—Koniontron.

nate chronic catarrh, a special tympanic catheter. As it is included in his Koniontron for direct inflation and injec-

tion of the tympanic cavity, the description of the latter appliance is appropriately given here. Dr Weber-Liel thus indicates the class of case in which the

and covered with india-rubber (length 16-18 cm., thickness $1\frac{1}{4}$ - $1\frac{3}{4}$ mm.). Some are made with the aperture in the side of the catheter quite close to the end.



FIG. 66.—The Koniontron Applied.

use of this catheter is required. In cases of long-continued chronic catarrh, where old inspissated and viscid accumulations are present in the folds of the membrana tympani, in the spaces between the malleus, in the anterior and upper walls of the tympanic cavity, in the niches of the labyrinth, or around the articulations of the ossicles, giving rise to decreased mobility both in the membrane and ossicles. Experiments on dead and living subjects show that the simple air douche, and the ordinary methods of treatment are not sufficient to wash them away. If the passage through the Eustachian tube is difficult, even the strongest air douche loses much of its power through the increased friction, and the injected fluid is sent, not where it is intended, but to the bottom of the tympanic cavity or into the cells.

The best fluid to employ is a solution of carbonate of soda, 10 grs. to the ounce. My experience quite corresponds with that of Weber-Liel.¹ I have never found pain or inconvenience arise from this solution.

The Koniontron (fig. 64) consists of three parts—

1. The tympanic catheter (*f*) is a thin flexible catheter spun of strong silk

(*a*, *b*), made from hard caoutchouc.

2. The *Pravaz* syringe (*c*, *d*) is screwed on the syringe, and joined with a tube and balloon; a bone top is inserted into the upper part to join it to the tympanic catheter.

After washing out the naso-pharyngeal cavity, a silver catheter is inserted into the mouth of the Eustachian tube, and the flexible tympanic catheter is pushed through it by a rotatory movement. Graduated markings show how far the catheter is to be introduced.

This flexible catheter is indispensable in many cases for diagnosis. It is also of service in applying suction to the tube and tympanum.

The tympanic catheter being *in situ*, and the silver catheter fixed, either by the surgeon as in the diagram, or by the patient, who must press it with his thumb against the septum-narium, the syringe with the middle piece must be joined to the tympanic catheter by the top (*e*).

The *Pravaz* syringe is necessary when we require to resort to intra-tympanic injection. The fine flexible catheter, or an ordinary catheter being introduced into the orifice of the Eustachian tube, the syringe is applied to this, and the quantity (10 to 20 minims) injected. By subsequent use of the bellows or small balloon bag, the fluid is forced in as spray into the tympanic cavity.



FIG. 67.—Small Bag attached to the Catheter for Douching the Eustachian Tube.

¹ *Progressive Deafness*, 1873.

CHAPTER IX.

GENERAL THERAPEUTICS—*continued.*

THE ARTIFICIAL MEMBRANE—INDICATIONS FOR USE OF—VARIOUS FORMS OF—METHOD OF APPLYING—ARTIFICIAL AIDS TO HEARING—EAR-TRUMPETS—AUDIPHONE—DENTAPHONE—POLITZER'S EAR-TUBE—AURAL FORCEPS—TOYNBEE'S—THE LEVER FORCEPS—THE AURAL SNARE—THE NASAL DOUCHE—POST-NASAL DOUCHES—NASAL INSUFFLATORS—LÖWENBERG'S GALVANO-CAUTERY—PARACENTESIS OF THE MEMBRANA TYMPANI—ELECTRICITY—MASSAGE.

THE ARTIFICIAL MEMBRANE.

IN applying an artificial membrane for the improvement of hearing in the case of perforation of the membrana tympani, there are some facts that must be remembered, both as regards the manner in which the false membrane acts and its mode of application. It does not improve the hearing by merely closing the opening; on the contrary, closure frequently disimproves it. The pressure on either the malleus or incus is distributed through the stapes to the labyrinth, or it may be directly to the stapes. This direction of the applied pressure must vary in different positions or conditions of the ossicles dependent on the amount of destruction or displacement which has occurred. But the artificial disc may improve the hearing by changing the leverage action of the ossicular chain, and then altering the pressure on the fluid of the labyrinth. Knapp points out how diminution of tension may follow from the pressure of the artificial membrane on the short process of the malleus, which, if pressed inwards, would release the lower arm, and move the stapes outwards. Thus it comes to pass that in some cases where no aperture in the membrane exists, the pressure of the artificial disc improves the hearing by acting on the equilibration of the fluid in the labyrinth. Thus, also, we see why it is that the results which follow from its use are so variable, and how necessary it is to try patiently and perseveringly to ascertain whether it improves the hearing or not by altering the direction of the pressure. This experiment may have to be repeated a few times. It follows equally that we must seek for other causes of disturbance of equilibration than the ossicular in the appli-

cation of an artificial membrane, and, if possible, remove these; as, for example, any obstruction in the Eustachian tube. Other possible consequences than the improvement in hearing must be remembered in connection with the use of the membrane, be it made of rubber or wool.

It may be said that these only follow from the careless or improper application or use of the membrane; yet, as they do so follow, it is well to bear them in mind. The disc may cause pain and irritation in the ear, especially if it be too long or too forcibly applied. It may also produce giddiness. It may bring about septic states of the meatus and middle ear if worn too constantly, if it be not removed at night, or if the ear is not systematically cleansed during its use, and attention paid to the periodical disinfection of the ear passage. If these precautions be taken to obviate such consequences, and that patients are given precise instructions, no harm is likely to follow the use of the membrane.

Of late years, for *hospital practice*, in the humbler classes, I have seldom resorted to any membrane save there was marked improvement, but I must say that in my experience, in a large percentage of perforation cases, that improvement is not sufficient to compensate for the inconvenience and slight risk that attends the use of the artificial membrane, particularly in the poorer classes of society, where neglect of the artificial membrane is often found to be followed by bad results. It is better in such persons, at first, to get the drum cavity and perforation into as healthy a state as possible, enforcing on the patients a periodical visit, and unless they are very intelligent, I do not trust them with an artificial membrane.

The figures represent some different forms of tympanum. In practice it will be found that the best results are to be got from the ball of absorbent wool or the plain rubber disc. In applying either the ear must be cleansed and the mem-

patient while wearing any artificial membrane can, with the aural probe and absorbent cotton-wool, keep the ear passage and drum-head perfectly clean, and apply any disinfectant solution necessary for the purpose.

ARTIFICIAL AIDS TO HEARING.

Artificial Aids, Ear Trumpets, &c.—There must ever remain a number of patients who consult us for deafness, and for whom we can only advise some artificial aid to assist the hearing. The present state of our knowledge in differentiating the conditions benefited by the various kinds of trumpets, ear-tubes, auricles, audiphones, dentaphones, &c., is anything but satisfactory. Some cases are but little improved by any form of apparatus; there are extensive changes

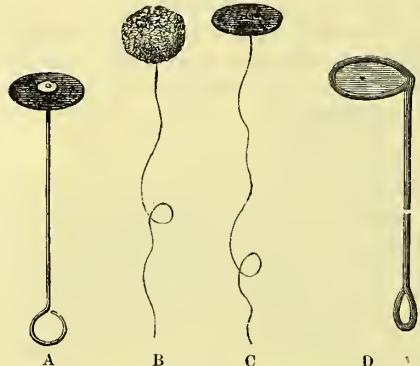


FIG. 68.—A, Toynbee's; B, Yearsley's Cotton Wool; C, Toynbee's; D, Turnbull's Membrane.

brane applied either with a small membrane forceps or by its stem, the disc or wool having been first moistened with carbolised glycerine, or solution of bichloride of mercury in glycerine, strength $\frac{1}{5000}$.

It is best to remove all artificial membranes at night. Toynbee's tympanum can be had either with a stem or piece of thread attached, the latter being applied with a small tube. Yearsley's is a simple egg of cotton-wool. Field's is a combination of Toynbee's artificial membrane, with Yearsley's cotton-wool. The wire is carried beyond the india-rubber for about a quarter of an inch, and terminates in a second disc made of flannel. The space between the two is filled with a small

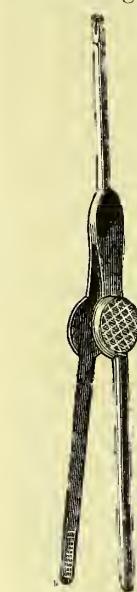


FIG. 69.—Forceps for applying Yearsley's Wool, with Tube for carrying Toynbee's Membrane.

portion of absorbent cotton-wool, which takes up and communicates to the flannel disc any medicated solution which it may be desirable to apply. Turnbull's tympanum has a steel stem at the side. A

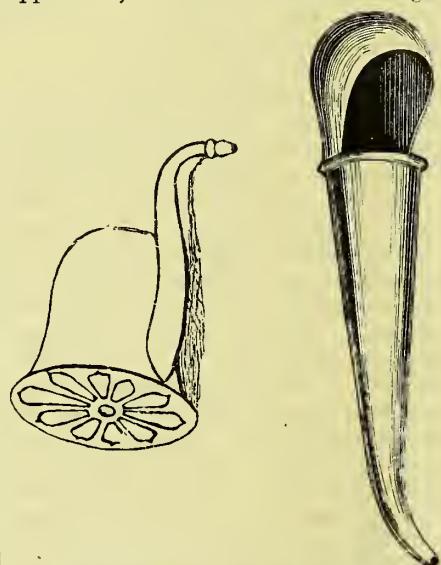


FIG. 70.—Ear Trumpets (Hawksley, and Krohne & Co.) in the ossicles, or the nerve itself is diseased, and the ear can only hear certain tones, of high or low pitch, which cannot be conveyed through a trumpet. Still, in a large number of cases the patient is made fairly comfortable by some such means of hearing and carrying on conversation. Also in public buildings such aids are indispensable.

It is not possible to speak positively of any particular form of ear trumpet, inasmuch as it is purely a matter of experiment with each individual case which one is found to give the best results. I figure here a few of those

that I have found most useful in practice. The light, conical, folding trumpet, made of japanned tin, I have generally ordered of late; it is the best, and most convenient for the pocket. The small bell-shaped trumpet is convenient and portable.

The folding audiphone of Rhodes is simply a fan, made of thin vulcanite, which folds up, one end of which is



FIG. 71.—Audiphone.

applied to the teeth, while, with the handle held by the listener, the convex surface is held towards the speaker.

The dentaphone consists of a small vulcanite clip connected with a small circular vulcanite box by a string, some-

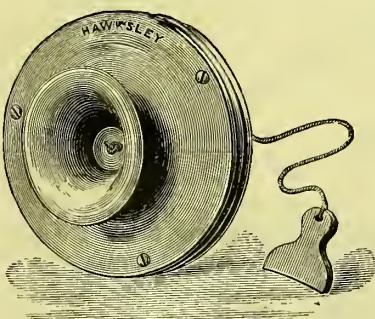


FIG. 72.—Dentaphone.

what like the ordinary toy telephone. With it I sometimes had better results. The proportion of cases in which such

aids improve hearing in my experience is very small. Most patients object to the conspicuous nature of the audiphone, and the majority hear best with a trumpet of some kind. It is a matter of experiment in all cases, and perhaps we may expect to find about 5 per cent. of deaf people benefited by either appliance. Any one can make an audiphone for himself from a piece of very thin ashwood, which is the best for the purpose. This is steamed, and when warm given the suitable curve. The teeth must be separately tried to test the conduction. It must touch a natural tooth. The patient must then be spoken to in different tones. He may be tried with the piano or singing. A portion of a book and the same extract, may be read aloud from day to day, so as to test the improvement. A common Japanese fan makes a very good audiphone. The advantage derived from small instruments worn in the meatus is generally very slight. Politzer devised a small trumpet to diminish as much as possible the loss of the sound-waves during their reflection, and to conduct them into the auditory meatus. I have had in many patients a satisfactory result with this little trumpet. It must fit the meatus well. The instrument is here represented. It is made of flesh coloured vulcanite, and is not conspicuous.

The narrow part fits into the ordinary meatus, and the wide portion is turned towards the concha. There are three different sizes, the larger measuring in length $2\frac{1}{2}$ cm.; at its outer opening it has a diameter of 12 mm., and at the inner aperture it has a diameter of 5 mm.

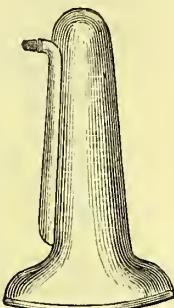


FIG. 73.—Small Vulcanite Trumpet.

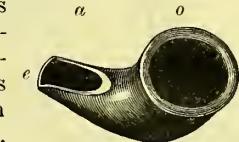


FIG. 74.—Politzer's Ear Tube (actual size).

AURAL FORCEPS, ETC.

For removing small particles of dead cuticle and loose foreign bodies, which can be readily caught, such as cotton-

wool, sponge, &c., either the rectangular forceps or the alligator forceps are simple and handy appliances. But for the removal of granulations or small polypi or minute sebaceous tumours, and in fact in all cases in which we require a forceps adapted to grasp expeditiously a minute growth or small particle of any kind in the meatus or on the membrane, the only forceps we require is the lever forceps, shown at page 45, fig. 23. A movement of the thumb closes the ring

sized speculum is introduced into the meatus, and the light well thrown into it with the spectacle mirror. A 20 per cent. solution of cocaine having been previously applied, an assistant supports the head of the patient, and when a good view of the polypus is obtained, the forceps is carried steadily down to it with the rings slightly apart; the rings being now fairly opened, the polypus is grasped by pressure on the lever, and removed. The forceps, in the

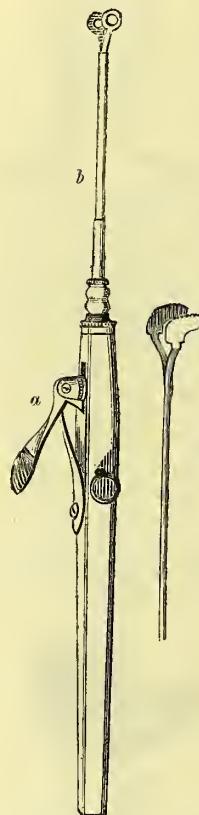


FIG. 75.—Toynbee's Lever-Ring Forceps.

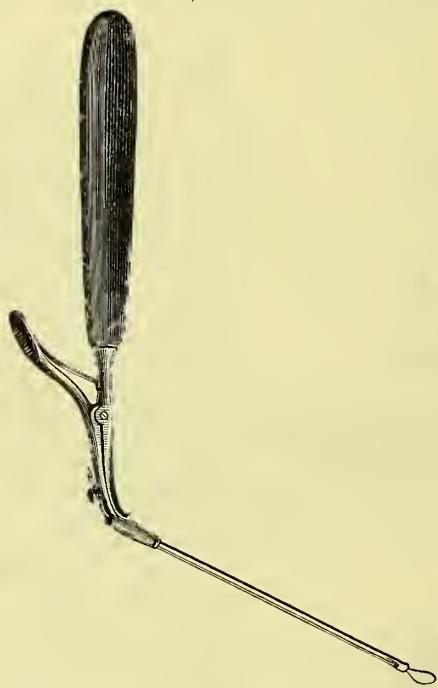


FIG. 76.—Colins' Ecraseur.

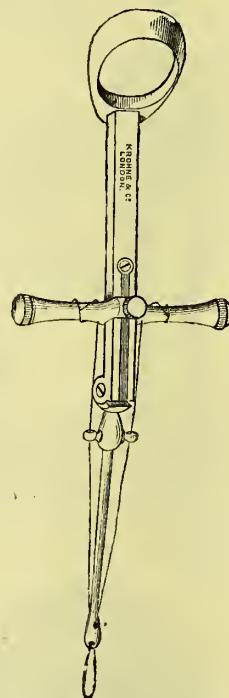


FIG. 77.—Durham's Modification of Wilde's Ear and Nose Polypus Snare.

blades of the forceps, and the view is not obscured in consequence of the direction of the handle.

The lever-ring forceps of Toynbee is also a useful and delicate instrument for the removal of small vascular polypi. In using either of these forceps the patient is made to stand with the head inclined a little to one side; a large-

case of two or three polypi growing from the membrane or meatus, may have to be introduced some few times in order to remove the entire of the growth. If bleeding obscures the view, it is well to wash out the meatus with hot water, and then dry the surface of the membrane or the bleeding part before reintroducing the instrument.

To illustrate the use of the lever-ring forceps, I may cite a case which came under my notice. A boy, with complete perforation of the membrane in both ears, applied for relief at the hospital. He had been previously subjected to treatment, and was under my care some years since, when he was threatened with brain mischief with severe otorrhœa. On syringing the left ear I perceived in the cavity of the tympanum, which was quite exposed, and growing from its roof anteriorly, a small tumour, quite white, on the surface of which I could distinctly trace vessels. I at once suspected a cystic tumour growing in the tympanum. I made with a fine lance-headed knife an exploratory incision, and found that it entered easily into the mass. I now passed in a Toynbee's forceps, and closing the ring on the sac completely removed it from the cavity of the tympanum. There are in Plate I. (figs. 4 and 8) drawings of the tympanum before and after the removal of the tumour.

The aural snare, originally devised by Wilde, is necessary for the removal of larger polypi. In all cases it is well with the probe to ascertain the size and attachment of the polypus. This having been done, and the patient's head steadied, the wire loop of the snare is applied and the growth removed. It may be well to use cocaine to the meatus beforehand, but if the instrument be properly applied to the pedicle there is little pain caused by the removal, and syringing with hot water quickly restrains any haemorrhage. When this has ceased, then the application of cocaine subdues the slight pain which may subsequently be present for a short time. With children it is often necessary to give an anæsthetic.

THE NASO-PHARYNX—THERAPEUTICS.

In the chapter on "The Naso-Pharynx in relation to Deafness," the reader will find discussed the treatment of those morbid states in which audition is affected. I propose here to offer a few general observations on the therapeutics of the naso-pharynx.

For ordinary practice these appliances will be found to answer most purposes of medication. The post-nasal syringe of

Dr Solis Cohen; a nasal auto-insufflator, as that of Mr Bryant; for the surgeon's use by far the best insufflator is that of Káhiérsky; such a nasal spray

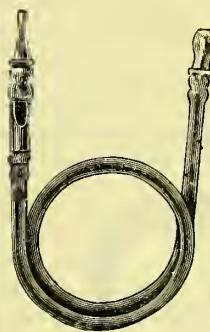


FIG. 78.—Auto-Insufflator (Allen & Hanbury).

as that made for me by Messrs Maw on the plan of Lefferts, to which an ordinary post-nasal spray-pipe may be adapted; the galvano-cautery of Löwenberg; some laryngeal brushes which can be easily



FIG. 79.—The Hand Nasal Douche.

bent for the naso-pharynx; a few intrauterine probes, roughened, or those with screw ends for carrying cotton-wool and medicated solutions; an ordinary syringe with a piece of rubber tubing a few inches long, which can be passed along the floor of the nostril to wash out the nares and naso-pharynx, and Weber's nasal douche. For poorer or hospital patients a syphon douche, with rubber nasal piece, and which costs only eighteenpence, may be ordered. It will be found as efficacious as the best (Maw & Son.) The substitute for an auto-nasal insufflator I have used for the past fifteen years (as likewise for the eye) is a piece of rubber tubing about one foot long, a portion of

thick glass tubing (from a feeding bottle) being inserted at one end and a quill at the other, which may be covered or not with rubber. In treating persons who cannot afford costly appliances such simple and inexpensive ones are acceptable.

The Gargle.—To thoroughly wash the pharynx with a gargle in cases of follicular pharyngitis, tonsillar hypertrophy, and general pharyngeal relaxation, is

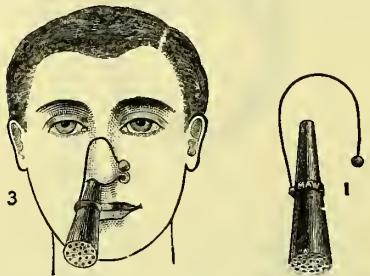


FIG. 80.—Nasal Irrigator (Ward Cousin).

frequently a most essential adjunct to more direct applications to the nose and naso-pharynx. To get a patient to do this properly he should be made to lie down on his back, and keep the head low when gargling the throat. With a little education and practice he can learn to force the fluid up behind the soft

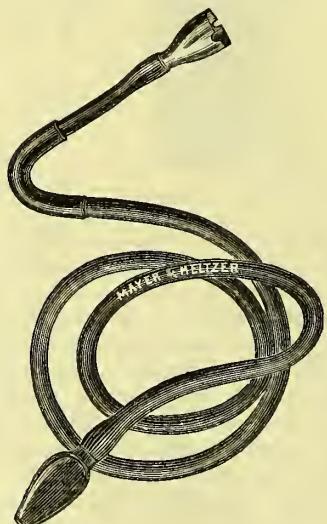


FIG. 81.—Syphon-Nasal Douche (Weber).

palate or eject it from the nostrils. The use of a nasal spray or douche is a much more satisfactory method of insufflating

the nasal passages than the plan sometimes adopted of directing the patient to sniff up some medicated fluid. A small portable insufflator after the plan of Sass, which can be carried in the pocket, and contains so much of the fluid or powder required, can be had for those who are travelling about much.

The Nasal Douche.—The nasal douche of Weber consists of a tube from 3 to 4 feet in length, a weighted end for insertion in the liquid, and a nasal piece (better olive-shaped) for fitting into the nostril. By raising the vessel in which the weighted end is suspended we can graduate the force of the flow. Patients occasionally complain of the effects, in producing uncomfortable giddiness, headache, faintness, tinnitus, or pain, these results taking place even when the douche was used with every care and precaution possible. Others can bear it with impunity. It is better to discontinue it when those indications of mischief arise, otherwise we may find otitis media following its use, especially if any strong solution is employed. In the application of the syphon douche the patient should be told to bend the head slightly forwards, inserting the nose-piece in one nostril, the steam running out through the other. The vessel containing the fluid should not be, when the douche is first used, more than a foot above the patient's head; while the stream is passing the patient must not swallow but keep the mouth open. It should not be employed if one nostril is impermeable. The douche may be used for simply drawing the liquid into either nostril; the tumbler in which is the weighted end is then held by the hand a little below the level of the head.

I have never found any serious effects follow the use of the syphon nasal douche. I have occasionally had to abandon it in consequence of headache, frontal ache, giddiness, and earache, resulting. This occurred only when permitting the stream to pass through from one nostril to the other by the usual method of holding the head forwards. But I have found that such symptoms were more frequently due to neglect of the instructions given to patients for the use of the douche, for they have disappeared when the following precautions were adopted:—(1) The regulation of

the force of the stream, the patient holding the vessel of fluid in the hand, raising or lowering it according as it is wished to increase or lessen the strength of the douche; (2) the maintenance of a proper temperature of the fluid (about 100°)—the colder the douche the greater the risk of unpleasant results; (3) the avoidance of strong saline solutions—such concentrated fluids entering the Eustachian orifice may cause intratympanic inflammatory troubles. The mouth should be kept slightly open during the act of douching, and for the



FIG. 82.—Nasal Irrigator (Woakes).

moment or two it is better to direct the patient to suspend his breathing. After douching it is advisable to use an inflating-bag, and a few times inflate the tympanum. The thumb and forefinger may be used to check the flow, and transfer the nose piece to either nostril. Frequently it is not necessary to do more than allow the stream to pass from a height a little above the head into either nostril. If the douche cannot be borne, or if we find it is not tolerated when the stream is permitted to run from one nostril through to the other, this latter plan may be followed. It is far better than the clumsy and more unpleasant mode of sniffing the fluid out of a vessel. I prefer it or a

hand spray to the use of the nasal irrigator (fig. 82).

Both for the surgeon's and patient's use the post-nasal douche and post-nasal syringe, as represented in the cuts, are most useful. In catarrhal and ozaenaceous states we may wash the nares, anterior and posterior, thoroughly out with these douches. The patient is placed with the head inclined to one side and forwards, the tube is gently passed back to the pharynx through the nostril, and the stream runs from the opposite. The post-nasal syringe (Solis Cohen) has its beak carried behind the soft palate either by the patient himself or the surgeon, and the head being held forwards, the fluid is

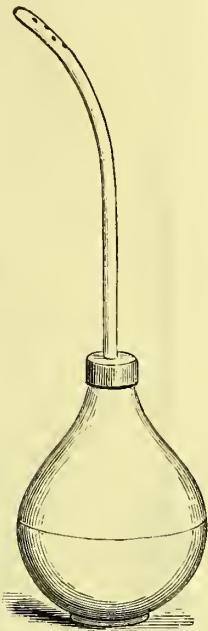


FIG. 83.—Nasal Douche, patient himself or with soft metal pipe (Lennox Browne).

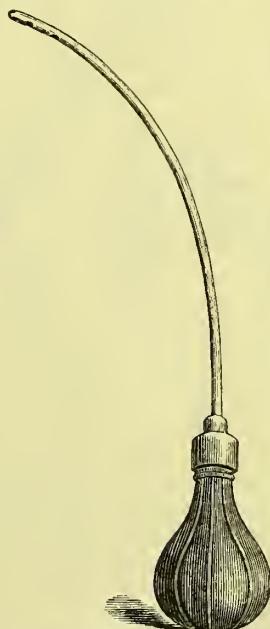


FIG. 84.—Smaller Douche, with soft rubber pipe (Weiss).

injected through the nostrils. The patient can himself prepare his medicated fluid.

The powder that I have been in the habit of using the longest, and one that I still have considerable faith in, for nasopharyngeal congestion and thickening, is the combination of bicarbonate of soda (2 pts.); chloride of sodium (1 pt.); baborate of soda (1 pt.)—I use this in the proportion of about 2 to 5 grs. to the ounce of water for the nasal douche, and perhaps 10 grs. to the ounce for the nasal spray. Chloride of sodium (2 pts.), chloride of ammonium (1 pt.), bicarbonate of soda or baborate of soda (2 pts.) is another admirable powder for the nasal douche used in about the same strength as the last. I generally direct about four ounces of fluid to be used at one sitting—a wine-glassful for each nostril. Chlorate of potash (1 pt.), boracic acid, salicylate or baborate of soda (1 pt.), powdered sugar (2 pts.), may equally well be used. Sometimes the simple powders of bicarbonate of soda, chloride of sodium, or baborate of soda will be found more efficacious than the compound ones.

When we desire disinfectant douches we have them in *weak* permanganate of potash, boracic acid, salicylic acid, and carbolic acid solutions.

I prefer to use all weak astringent and disinfectant washes by means of the nasal spray, such as alum, tannic acid, sulpho-carbolate of zinc, chlorinated soda (3*ii.* liquor. sodæ chlor. ad 3*viii.*), chloride of zinc (gr. *ii.* ad 3*i.*), carbolic acid (gr. *ii.* ad 3*i.*), bichloride of mercury (1 to 2000), hazeline with infusion of matico (3*i.* in 3*viii.*), cocaine (with the special cocaine spray).¹ The more concentrated solution of glycerine and perchloride of iron (grs. xx.—xxx. ad 3*i.*); the combination of aldehyde (2 pts.), and carbolic acid (1 pt.), glycerine (5 pts.); iodol or iodoform in ether (grs. xx.—xxx. ad 3*i.*); chromic acid (grs. x.—xx. ad 3*i.*); chloride of zinc

(grs. x.—xx. ad 3*i.*), nitrate of silver (grs. x.—xx. ad 3*i.*), are best applied with the nasal probe and cotton-wool. The nares should be wiped clean with absorbent wool before any of these solutions are used. Should severe smarting follow



FIG. 85.—Post-Nasal Syringe (Solis Cohen).

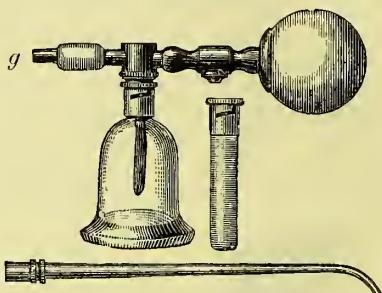


FIG. 86.—Káhíérsky's Nasal and Throat Insufflator.²

the application and last any little time, a warm alkaline stream should be passed through the nostrils. The powders for insufflation I find of most service in catarrhal conditions are those of iodoform (deodorised with fresh coffee, coumarine or vanilime), tannic acid, catechu, oxychloride of bismuth, and in tonsillar and throat congestions guaiacum. A small quantity of any of these powders may be used for each insufflation, powdered starch or lycopodium making an admirable basis. Fatty preparations serve in ulcerative states. I do not much care for greasy applications to the nasal membrane, but we can well apply in this manner iodoform or iodol, bismuth, belladonna, morphia, bichloride of mercury, the oxides of mercury, iodide of potassium, oxide of zinc, cocaine, the best medium for suspension being one part of vaseline and two parts of lard to four parts of lanolin. There can be no doubt that

² Another and convenient form of this instrument may be had with a bellows attached; various nose and throat tubes can be affixed at *g*.

¹ See chapter on Naso-Pharynx.



FIG. 87.—Ball Insufflator for Pharynx and Larynx.

lanolin, diluted with lard, geoline, or vaseline, makes a capital absorbent basis for ointments. Idol is the best substitute for iodoform, being quite devoid of its unpleasant odour, and possessing all its properties without any of its toxic effects. I give this opinion of idol from personal use of the drug. Some time since I suggested the use of iodoform cigarettes. These cigarettes were made of the powdered and prepared eucalyptus leaf, with some eucalyptol added. They were of two strengths (gr. ss. and gr. i.). I had also some plain eucalyptus cigarettes made, and others with chloride of ammonium. The latter did not, however, ignite well. I have several times known good results follow the use of these cigarettes in chronic nasal and post-nasal conditions. They are not quite powerful enough. I have had some made of idol, so as to avoid the unpleasant odour of the iodoform. By Valsalva's method the vapour of the iodoform may be driven into the Eustachian tube and tympanum.

My experience of medicated wools, bougies, and pastilles is not favourable in catarrhal states of the naso-pharynx. Finally, in regard to gargles in cases of relaxation and follicular states of the pharyngeal membrane, I find these powders answer admirably:—*R* aluminiis $\frac{3}{2}$ ii, acid boracic $\frac{3}{2}$ ii, boracis $\frac{3}{2}$ iv, 10—20 grains added to the ounce of water for gargling. *R* potassæ chloratis $\frac{3}{2}$ ii, aluminis, $\frac{3}{2}$ ii, acid. salicyl, boracis, $\frac{3}{2}$ iv. *M.*, to be used as the last. A little 20-grain wooden cup measure should be furnished with the powders.

Finally, with reference to operation proceedings generally, I trust that, as in another notable instance, we shall not find ourselves carried away by what may be apparently brilliant results in the hands of some, or by any speculative theories put forward by others, to freely mutilate and destroy the integrity of the nasal passages. From the perusal of other chapters in this work it cannot be thought that I do not attach due importance in the treatment of tinnitus, deafness, and giddiness, to securing patency of the nasal passages and a healthy condition both of the pituitary membrane and the other structures in the nasal fossa and naso-pharynx. But in operative procedures, as yet young in

their life history, I submit we are bound to go cautiously; and I believe I am right in saying that in general practice the most successful surgeon will find that the cases which demand mutilation of the osseous structures of the nasal fossa to the extent of extirpation of the inferior and middle turbinated bones are rare; and, for myself, speaking in the light of a patient, I should prefer to be in the hands of one whose turbinated pruning-shears was seldom used, than in those of one whose mind had inseparably related to giddiness, and tinnitus, or deafness, the perpetual craze of hypertrophied, necrosed, enchondromatous, or otherwise affected turbinated bones. At least mine should remain where they are, even were they proved to be as rebellious and ill-behaved as it is asserted they can be, until I had sufficiently "exhausted the resources of civilisation" to compel me to see them evicted on a plate. In those aural cases which come under my observation that demand operative interference in the naso-pharynx, I am influenced by (1) the presence of hypertrophied tonsils; all such I believe

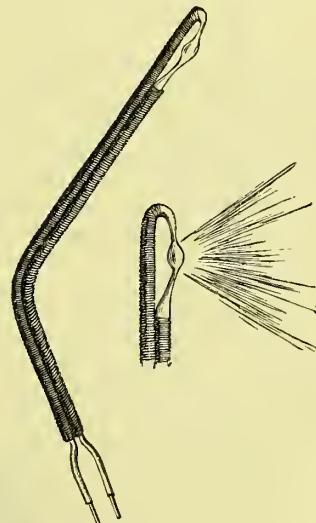


FIG. 83.—Lowenberg's Galvano Cautery.

should be reduced or removed in cases of tinnitus and deafness; in children the snoring at night and impeded respiration frequently disappear after removal of enlarged tonsils without any further interference, while the attendant deafness is cured as soon as the Eustachian tubes are kept patent and the tympanic cavities are ventilated,—(2) the presence

of adenoid growths,—these should be removed; (3) hypertrophied portions of turbinate bones and morbid growths, polypi,—these should be excised; (4) displacements and enchondromatous enlargements, with consequent deviation of



FIG. 89.—Mackenzie's Shield for Protecting the Nasal Septum, for use with the cautery.

the septum, require interference to free the obstructed nasal passage.

In cases of chronic coryza, and in

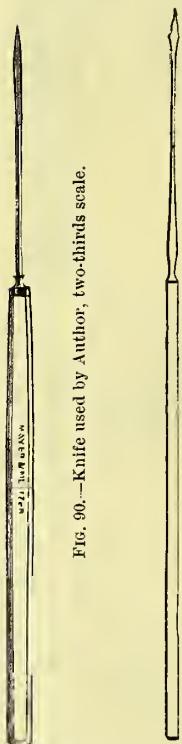


FIG. 90.—Knife used by Author, two-thirds scale.

FIG. 91.—Hinton's Myringotome.

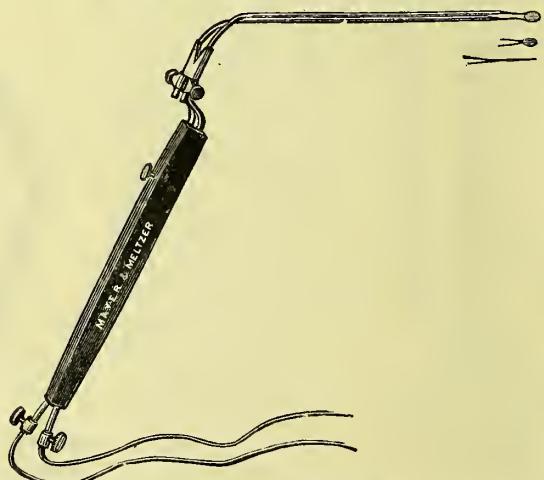


FIG. 91.—Hinton's Myringotome.

hypertrophic states of mucous membrane covering the turbinate bones, the *galvano cautery* of Löwenberg will be found a simple and efficient means of reducing the hypertrophy and restoring the calibre

of the nasal fossa. A thin bladed speculum of Duplay is inserted into the nostril, and the interior of the nostril well exposed with a good light. The cautery, various shapes of which can be had, either with loop or blade, needle, or button ends, is then introduced cold and applied to the hypertrophied part. The septum should not be touched with the platinum. The lateral position of the cautery secures against this accident which causes pain. The best battery is a modified Trouv's. The current is completed by raising the cover of the box in which are the cells. Such a battery I have for years used, and it has never failed me. Care should be taken to employ the fluid and clean the cells often, each time the battery is used. This takes but a few minutes.

Of incision of the membrana tympani. It may be said that every surgeon who undertakes the care of aural cases, and anyone who presumes to treat deafness, or, indeed, to guide the aural complications met with in such acute diseases as scarlatina, the various fevers, or acute inflammatory throat affections, should be prepared to carry out this step safely and efficiently. It is not a difficult one, and the landmarks to guide us in its performance are clear and distinct. The safety and utility

of this procedure, which Hinton so emphatically advocated in cases of catarrh of the tympanum, closed Eustachian tube, rigidity of the membrana tympani in various states, accompanied by obsti-

nate and troublesome tinnitus in the acute suppurative catarrh of scarlatina, is a recognised operation, and one which can alone relieve certain morbid states causing or accompanying deafness. In many cases of catarrh of the tympanum, accumulation of mucus with incurved membrane, incision is followed by results far exceeding our most sanguine expectations. At the same time we must be prepared for many negative trials and disappointments. Hinton may have been too enthusiastic as to the ultimate place that this operation would take in aural surgery, yet undoubtedly this enthusiasm was warranted by the brilliant success which attended his treatment of a large number of otherwise hopeless cases.

Nor has the history of the operation and its success with others proved that he over-estimated its value. On the contrary, in the hands of the most eminent and reliable authorities its value has been completely established. I cannot say how often I have incised the membrane during the past eighteen years both in hospital practice and private. But of the many patients on whom I have operated only two suffered to any extent. One of these was after an early attempt, and I made the mistake, against which I was subsequently warned by Mr Hinton, of performing a second operation, and leaving too short an interval to elapse after the first incision.

The other was in the case of a lady with a very thick membrane, and, in making the incision, I cut a little too freely. These are the only cases I can recall to mind in which I had subsequent inflammation. In the one, inflammation extended to the mastoid cells and tympanum, and there was a profuse discharge for days, resulting, however, strange to say, in a decided improvement of the hearing. The other case had only a slight attack of inflammation of the membrane and meatus, which subsided under treatment.

The operation may be performed thus:—The patient is placed sitting opposite a good light with the head fixed, the mirror throwing the light well down on the membrane through a wide speculum. A small lance-headed knife shaped like a very fine cataract knife (a sheathed instrument is preferred by some) is carried

steadily down to the membrane with the edge of the blade turned up. The membrane is punctured generally behind the handle of the malleus, the blade is carried up to any extent the operator sees fit. There is no bleeding, and but very little pain. I prefer a knife with a long handle and shaped like a small cataract knife, with but one cutting edge. The shank of the blade may be set at an angle to the handle. In chronic cases, for some days before performing the operation, it is a precautionary measure to thoroughly Politzerise the tympanum, and to use a warm carbonate of soda douche with the Eustachian catheter. Free inflation with Politzer's bag should be practised after the punctures, and the patient can resort to Valsalva's method, so as to force any fluid serous secretions or mucus through the aperture. The patient should exercise caution after the operation—avoid cold and stimulating diet. I do not recommend mechanical means to keep the perforation open, such as the eyelet of Politzer or the ring of Voltolini.

M'Keown of Belfast suggests a method of making an artificial perforation which would remain open for a period varying from two weeks to two months. He makes a triangular flap of the membrane, commonly selecting either that part in front of or that behind the handle of the malleus. He uses a speculum, and illuminates the membrane by the frontal mirror. He then introduces the knife—a very fine straight knife with a thin handle—punctures the membrane in front of or behind top of the handle of the malleus, cuts upwards as far as he can; then he makes a second incision, beginning below, either at the anterior or posterior part of the membrane as the case may be, and in a horizontal line with the lower end of the first incision, and cuts upward until the two incisions join. The flap thus formed, unless in case of a very thickened membrane, falls down, or may be turned down with a fine probe, and commonly remains in position, adhering to the membrane below by blood exuding from the cut surface.

ELECTRICITY AND MASSAGE.

It may be that the disappointing results experienced in practice in the application of galvanism are the conse-

quence of want of accurate adaption of the galvanic current to the individual case under treatment both as regards the intensity and direction of the current. Dr Althaus mentions the details of a case of troublesome tinnitus, with attendant symptoms of vertigo, cured by the application of electricity, guided by the test of Brenner's formula in the first instance.¹ He says, referring to aural tinnitus, that a judicious and careful application of electricity, to cure or relieve a considerable proportion of this latter class of cases, where there is no coarse lesion giving rise to the undue pressure, but where this latter is probably owing to disturbed vaso-motor influence, is either ignored or doubted in most of the best works on aural diseases. This unfavourable opinion of the authorities is undoubtedly due to the circumstance that there is perhaps no other complaint the successful treatment of which by means of electricity requires so much care because of the physiological effects of that agent, such delicate adjustment of apparatus, and such technical skill in manipulating the same, as tinnitus of nervous origin; while, on the other hand, a haphazard application of electricity, even by those who are tolerably well acquainted with the other more common uses of the battery, is likely to do rather harm than good, and the chance thereby accomplishing a cure must be considered as exceedingly remote. The chief rule for treatment must be to utilise that arrangement for treatment which is found effectual in arresting the noise, regard being had at the same time to a gradual reduction of current-strength, and, if necessary, a fresh increase after diminution. It is therefore of paramount importance not to proceed by routine, but to ascertain as accurately as possible the physiological response of the suffering nerve to the voltaic current in each individual case of tinnitus of vaso-motor origin previous to the beginning of a galvanic treatment.

The question whether the auditory nerve is directly stimulated by electricity, and that the subjective sound sensations are due to this direct excitation, is still debated; this being the view taken by its principal advocates, Brenner, and also Erb, Moos, Hagen,

¹ *Lancet*, July 31, 1886.

while others, as Schwartze, believe that the sensations are caused by reflex irritation of the trigeminus and the sympathetic nerve. Brenner has formulated the effects produced by varying degrees of intensity in the normal state of the nerve by the galvanic current, according to its direction, and the opening or closure of the current. Deviations from



FIG. 93.—Author's Eustachian Electrode, consisting of fine soft catheter containing wire tipped with sponge. The battery-wire is fixed by the brass screw-handle, and contact is made or broken at will by the little lever. The india-rubber band used by Mackenzie to carry round the neck in galvanising the vocal cords, with a piece of sponge in the centre which is connected with the battery, I place round the head, bringing the sponge over the mastoid process, hooking the band either round the head and over the mastoid or underneath the chin.

this normal formula are found in certain pathological conditions. The cathode being placed in the fluid, filling the meatus, a sound more or less loud is heard, according as there is hyperesthesia or dysesthesia, when the current is closed. If the anode be introduced, no sound is heard on closure of the current, but on opening it a sound of less intensity than with the cathode is perceived. I have little faith in the mere application on the mastoid process,

or through the external *meatus*. The part taken by all the muscles and nerves of the soft palate and naso-pharynx in maintaining equilibration in the labyrinth, already discussed, has to be



FIG. 94.—Author's Clip for Mastoid Electrode and Galvanic Speculum.

remembered. The enervation which we suspect in the tubal and intrinsic muscles is frequently indicated by the appearance of the muscles of the soft palate. The close connection of the muscular

structure of the entire soft palate and the Eustachian tube must be borne in mind, as well as the necessary dependence of a normal action of the Eustachian valve not merely on the smaller tubal muscles, but on those of the soft palate. The accompanying figures show the electrodes for the meatus, mastoid process, and Eustachian orifice.

Massage, which has proved so useful in the relief of pain elsewhere in the body, may be used with advantage to relieve pain in the ear. The patient or nurse should stroke with three oily fingers of one hand behind the ear, beginning from below, and at first using slight pressure. With the other hand both friction and pressure are made in the opposite direction. Though the massage may at first cause some increase of the pain, this yields gradually to a sense of relief, and not rarely pain altogether disappears. Massage may be repeated several times during the day. Weber-Liel specially recommends massage for middle ear inflammations, and those attacking the mastoid process.

CHAPTER X.

GENERAL THERAPEUTICS—*continued*.

THE HYGIENE OF THE NASO-PHARYNX—HYGIENIC PRECAUTIONS WITH REGARD TO DIET, CLOTHING, AND EXERCISE—THE TURKISH BATH—CLIMATE—DISINFECTION GENERALLY—DEPLETION AND COUNTER IRRITATION—LEITER'S REFRIGERATING AURAL TUBE.

THE HYGIENE OF THE NASO-PHARYNX—DISINFECTION OF THE EAR GENERALLY

In the prophylaxis and treatment of ear disease, we must not neglect those surroundings in climate, diet, clothing, and exercise, which more or less predispose to and perpetuate affections of the middle ear and naso-pharynx. We may apply to these organs the same rules, as the conditions which affect the latter generally influence the former. We have already, in the chapter on the "Etiology of Aural Diseases," considered the injurious effects which may follow on certain habits and occupations, as also to the effects of malaria, want of cleanliness

generally, neglect of the ear after the exanthemata; the presence of micro-organisms; and a variety of other causes of aural disease that might rightly be included under the head of hygiene (see chapter on "Causation"). It cannot be amiss, however, to draw special attention to some general hygienic precautions which cannot be neglected in the treatment both of the ear and naso-pharynx.

The Hygiene of the Naso-Pharynx embraces all those hygienic precautions as regards diet, clothing, and exercise, which assist in preventing and modifying catarrhal inflammatory conditions of the naso-pharyngeal tract. We may include also the influence of climate.

Without giving reasons we may generally admit, what every-day experience proves, that heredity has much to say to nasal and throat affections, more especially catarrhal states, moist and dry, and the secondary congestions of the mucous membrane which follow these. Syphilis in the earlier, gout in the latter years of life, are the maladies we most frequently see evidences of in the naso-pharynx. But independently of these, there is a common catarrhal temperament in which we find a predisposition to "catch cold," to "colds in the head," to "sore throat," to attacks of tonsilitis, to follicular congestions of the soft and hard palate, to enlarged and elongated uvula, to occasional attacks of hoarseness and hyperæmia of the vocal cords. How much the syphilitic or gouty taints may have to say to this it is generally hard to discover. I believe the former influence is present oftener than we are aware. The nasal catarrh, with characteristic post-nasal secretion, which we frequently find in young persons who have, both in the eye, skin, or teeth, evidences of hereditary syphilis, shows that here we have a region early manifesting the evidences of constitutional taint. Indeed the "snuffles" of infancy and the purulent rhinitis which are present in the syphilitic infant are still earlier proofs of this. On the other hand, it has to be remembered that from various exciting causes, such as adenoid growths, enlargement of Luschka's tonsil, occupations in which irritating substances enter the naso-pharynx, as dust for example (Mackenzie), the temperature and mode of heating of dwelling houses and business offices, post-nasal catarrh does commonly arise. Nor is there any doubt that in debilitated states of the system generally these catarrhal nose and pharyngeal troubles are more liable to occur and pass gradually into more extensive and inveterate affections, with permanent changes in the mucous membrane and subjacent structures.

The deafness which increases periodically with each cold caught, the patient will often tell us, has been preceded by an "out of sorts" feeling, a loss of appetite, and indigestion. Indiscretion of diet and the consequent dyspepsia are the constant attendants upon what is termed "an uncomfortable sensation in

the throat, and a stuffy feel in the head." I do not enter into this question of diet further than to remark that the simpler and the less complex the food, the less liable the mucous membrane appears to be to catarrhal attacks. But the one "accessory" of diet which unquestionably promotes this catarrhal tendency and excites congestive changes is alcohol in any form. It accentuates all naso-pharyngeal morbid states. But *alcohol* and *tobacco* are very frequently associated, while the conditions under which both are generally indulged in increase whatever hurtful effects they have in themselves. After-dinner libations in hot rooms surcharged with tobacco vapour taken before issuing into a cold atmosphere without, smoking and drinking in heated restaurants, and in warm billiard rooms, are some common examples of such attendant conditions. They are the most favourable to excite an acute, and to maintain a chronic, nasal catarrh. It is much after the ostrich principle of protection that delicate persons come from heated theatres, over-crowded ball-rooms, and warm churches into the colder atmosphere outside, imagining that some small oral respirator protects them from cold. It is a question if, by tending to increase the number of nasal respirations, it does not rather encourage a tendency to rhinitis. Naso-oral respirators are the only true protectors. Mr Whistler's is a most ingenious respirator of this class. But on emerging from warm buildings at night, a small portion of absorbent wool placed lightly inside the nostrils in no way impedes nasal respiration, and by delaying and filtering the rush of cold air, this is partially warmed before it reaches the nasal passages. The wool can be rolled into an egg shape, and, as Gottstein has recommended, can by a little screw shank be inserted in the nostril, the screw being readily freed (as with the aural probe, which I have made often answer the purpose) by reversing it. In cases of post-nasal catarrh and chronic catarrh it may seem unnecessary to insist that warm *under clothing* is an essential in preventing ordinary catarrhs. In our variable climate, with its easterly winds, the common error of "changing clothes" is the most frequent source of "colds caught." In the instance of women, from the nature of their dress,

and the exposure of the extremities, this is still more the case than with men. It is essential always to insist to aural patients on the necessity for a warm skin. Cold and damp feet I believe to be more frequently than is imagined a cause of deafness.

This is not merely as a secondary consequence of catarrh, but coldness and impeded circulation in the extremities act by favouring congestion of the circulation in the tympanum as effectually as they do in the case of the retina. This may be more likely to occur in women than in men. Especially is it to be feared before the catamenial period. "Keep the skin and feet warm," is, in the prophylaxis of deafness and tinnitus, from every sense in which we give this injunction a maxim only of second importance to "Don't neglect the throat." The skin and naso-pharynx are both in childhood and youth the vulnerable avenues through which noises and deafness approach in adult life. Among the many contrivances and forms of under-clothing for protecting the skin which we have at present, in the various combination suits, sanitary, pine wool, Indian cashmere and other, we can be at no loss to secure efficient skin protection. I prefer for the sensitive skin of some patients the twill silk porous longcloth.¹ It is made from the silk of the Indian wild worm; the fabric is undressed, does not change with constant washing, and is very light, warm, and durable. It makes the neatest and most comfortable underclothing for women I know of. But in cold bedrooms we have another frequent source of chill. The girl with sluggish cutaneous circulation retires from a warm sitting-room, removes warm skin clothing, undresses with a certain degree of exposure and consequent chill, and substitutes a cold linen or calico night-dress for the warm flannel or woof suit worn while exercising, or when sitting in warm rooms during the day. This she does often when the temperature is lowest (midnight), and the power of vital reaction the least.

That room of which the temperature is frequently most neglected in a house is the bedroom, the one of all others whose heat should be properly and uniformly maintained. In winter, while I

object to the enervating habit of hot-water tins and bottles for the feet, I see no objection to previously securing the heat of the bedclothes by a contrivance which can be removed on the person getting into bed. And further, the effects of the nightly change of clothing can be averted by substituting a light and loose flannel vest, which, covering the trunk, and placed on while warm, prevents the chance of chill. Down quilts I believe to be unhealthful; I can only say if asked why, "The reason I cannot tell, but I do not like them." I think they tend generally to enervate, to produce perspiration, to cause general relaxation, and are often used when they are unnecessary through carelessness, and from being looked on as a necessary portion of the bed furniture. Down quilts and feather beds are the warmest friends of catarrh. Not less foolish habits prevail which predispose to catarrh in rising from bed, such as standing on naked feet, or only in stockings, protracted exposure of the body while washing or bathing, prolonged toilet with the chest and arms uncovered. The other hygiene sin is one rather of omission than commission; the neglect of the use of a proper sponge bath in the morning, tepid where indicated, with suitable friction of the skin subsequently. True, the cold bath is an admirable preventive of catarrh, but as all know it has its dangers, is absolutely contra-indicated for some constitutions, and in these is liable to produce and prolong the very condition which it is intended to prevent.

The Turkish bath with its shampooing process is one of our most valuable modes of treating acute catarrh, and the resort to a few Turkish baths will occasionally relieve a chronic rhinitis; but I am no advocate for the too constant use of the Turkish bath, and certainly consider such dangerous in those predisposed to congestive states of the naso-pharynx and tympanum. I had a patient who died at the age of seventy-five, who for years took one Turkish bath at least daily, sometimes two. The bath was attached to the house. He was generally in robust health. On the other hand, I knew an old gentleman who broke the ice in winter and went in for his plunge in the river up to his eightieth year.

¹ Lewis & Allenby.

But such facts, though we are frequently confronted with them, establish nothing. They are parallel to the instances of ineptiates, inveterate tobacco smokers, vegetarians, and "one meal a day" eaters, who are quoted as living charmed lives. Coca chewers, one local authority tells us, suffer from cocaism, general anorexia, sleeplessness, and emaciation, dying prematurely old of marasmus, while another (Dr Scrivener) testifies to the harmlessness of the habit, and the advanced age to which coca chewers live without any deleterious results whatever accruing. Of the ill effects of sea-bathing in patients suffering from aural complaints I have already spoken, more especially those who practise diving, the strong salt water not alone entering the Eustachian tubes, and causing an otitis media, acute or chronic, but also acting as an irritant to the delicate pituitary membrane. Exercise, active, but moderate, taken with due attention to the risk attached to over-heating of the body, is the next best preventive of catarrh.

In climate we have one of the most valuable of all the hygienic means of arresting chronic catarrhal states of the naso-pharynx. Of all places on the Continent I have found the greatest good follow the use of the nasal douches and the waters of Aix-les-Bains. There are there in the baths the most perfect means of treating the naso-pharynx. At Aix-la-Chapelle, also, I have known both chronic and post-nasal catarrhs disappear. For gouty patients and debilitated patients, for whom an arsenical course is indicated, Royat and Bourboule in the Mont Dore district are to be preferred. I have also known patients whose catarrhal affection the change to such climates as those of Cannes, Nice, or Algiers immediately cures; while there are many who in winter loose the stuffy feeling in the nose and head in the clear and more bracing air of Davos or St Moritz. A few sea voyages have frequently a good effect on a chronic catarrh. Perhaps the best is a Mediterranean trip, with a short stay at Suez before the return journey. If sulphur waters are indicated we have our choice in those of Barèges, Bonnes, or Eaux-Chaudes.

Very much the same good result can be had at home by patients, at the proper seasons, availing themselves of such

health resorts as Bath,¹ Harrogate, Strathpeffer, Buxton, Malvern, Tunbridge, Torquay, and the south coast watering places. Lastly, the physiological connection between the sexual and naso-pharyngeal centres already alluded to must be remembered. This throws some light on the ill effects which follow excessive sexual indulgence, and which are manifested in the swollen and thickened condition of the pituitary membrane.

DISINFECTION GENERALLY.

We may subdivide our remarks on this subject into disinfection of the external meatus, and of the middle ear. I have previously referred to the Eustachian tube and naso-pharynx. It is hardly necessary to insist on the importance of early and free incision of the different inflammatory swellings, whether due to furuncle or follicular abscess, that occur in the meatus (the same remark applies to periostitis of the mastoid process in children). The tendency to multiplication and recurrence so characteristic of furunculosis is thereby lessened, if not prevented. I have seldom seen the application of strong (1 to 20) boracic acid or salicylic acid solution (in alcohol and glycerine) arrest such inflammation without incision. Löwenberg's plan of injection subcutaneously of bichloride of mercury into the swelling has decidedly aborted some severe cases. This does not, however, affect the rule that antiseptic treatment is the most valuable both prior to, accompanying, and after, either incision or bursting of an aural furunculus or abscess.

Danger of Poultices.—The one treatment to be deprecated is that by large poultices which cover the auricle. The reason for this has been already explained. The most dangerous (in one instance fatal) cases of diffuse inflammation of the meatus extending to the mastoid and temple that I have seen, have come on during the use of large linseed poultices. My plan is the common one of inserting, at frequent intervals, a small carbolised poultice in a muslin covering in the meatus, and relying on fomentations for the pain, but it is rather after the escape of pus that strict antiseptic precautions

¹ The recent balneal improvements at Bath are admirable, and quite equal to the continental arrangements.

are imperatively called for. As washes, I prefer those of perchloride of mercury (1 to 1000), permanganate of potassium, boracic acid and salicylic acid and chloride of zinc in combination with carbolic acid solutions. Perhaps the most effectual supplement to the use of these is an absorbent salicylic acid wool plug covered with some iodol or iodoform lanolin ointment, which is inserted by the patient and worn at night. The iodol, though its antiseptic properties as compared with iodoform is doubtful, has the advantage of absence of odour, but if this be not at hand, vaniline, coumarine, or coffee will serve to deodorise the iodoform. But it is a question how far washes of any kind are safely entrusted to patients' friends to use. Löwenberg insists on the necessity of using solutions, the water of which has been boiled, so as to deprive them of organisms. And certain it is that ordinary astringent lotions kept for any time contain quantities of fungi and bacteria. It is best to order concentrated alcoholic solutions of the ordinary astringents, a given quantity to be added to so much water (which has been recently boiled) each time the wash is used. But the cleanliness ensured by the surgeon himself *from day to day* is by far the most important. And this can only be attained *by careful and repeated drying of the external passage and tympanum*, if it be exposed, with absorbent wool, *after the meatus has been cleansed* by an antiseptic lotion in the first instance. This must at first be done by the surgeon himself with the aural probe, but an intelligent parent or friend can be taught, after a little time, to cleanse the canal. When the parts are thus cleansed with the wool the more powerful antiseptic solutions can be applied with the probe. I rely most on the mixture of absolute alcohol (2 parts), carbolic acid (1 part), and glycerine (3 parts). I generally prefer concentrated solutions to the use of insufflations of such powders as boracic acid, boracic acid and salicylic acid, and iodoform or iodol. If granulations remain and require restraint, chloroacetic acid and chromic acid are my favourite agents.¹ Both of these should be applied carefully, and only to the spot affected. But they never, if thus used, have any bad results.

The Middle Ear.—In patients suffering

from perforation of the membrane we require to wash out with some antiseptic the tympanum and Eustachian tube. This is best done by the conical nozzle which fits on the ordinary syringe and fills the meatus (see page 44). The head should be held well forward, the solution should be warm, not strong, too great force ought not to be used, the outer ear and tympanum should be cleansed beforehand as far as practicable.

We must avoid washing remains of pus and mucus that may lie in the external meatus with force into and through the tympanum. Chloride of zinc or carbolic acid solutions, especially the former, are perhaps the best to employ. After the fluid has passed from the nose the tympanum should be forcibly inflated a few times and the expelled fluid and mucus dried carefully off by the aural probe from the external meatus. Finally, the parts are touched with whatever antiseptic application is chosen.

Of late years the conviction has grown on me more and more that *the fewer washes we use in aural practice the better*. Daily or every other day attendance and dressing on the part of the surgeon, and the direct application of more concentrated solutions to the discharging surfaces which have been carefully cleansed, or insufflation of such a powder as boracic acid or salicylic acid, or deodorised iodoform, in all cases of chronic otorrhœal discharge, will be found the most successful treatment, and give the best permanent results.

Alcohol in different strengths, according to tolerance, as recommended by Burnet, I have found the most efficacious remedy in those cases of aspergillus, both of the meatus and tympanum, that I have treated. I believe it to be the best remedy also for healing or contracting a perforation. In granular conditions of the tympanum and post-polypoid states, I have found chromic acid carefully used (20–30 grs. ad $\frac{3}{4}$ l.) an admirable application.

By close personal attention to the cleanliness of the ear passages and the adoption of antiseptic measures at an early stage of the affection, such as those indicated, I believe surgeons generally would save the hearing of many ears now lost from the results of otitis, externa and media.

¹ See treatment of polypus, p. 93.

DEPLETION AND COUNTER-IRRITATION.

I do not think that we use *leeching*, more particularly the periodical leech or the artificial leech of Heurteloup, as often as we might in acute inflammatory conditions of the external ear and in chronic congestive states of the internal ear. In follicular abscess of the meatus, in myringitis, and in acute catarrhal attacks of the tympanum, experience has taught me that we have, in a few leeches applied behind the concha or inside the tragus, a most useful remedy, while I have frequently relieved the distress of a loud congestive tinnitus with a throbbing sensation in the ear by a periodical leech or two applied to the mastoid process at night.

Though *counter-irritation* over the mastoid is regarded as another old-fashioned remedy, still its derivative effects frequently arrest threatening inflammation in the meatus and tympanum, and in hyperaemic conditions of the internal ear the tinnitus may now and then abate under its influence. The liquor epispasticus (Smith), or the charta epispastica, are the cleanest and quickest vesicants. A capital embrocation to apply with the finger over the mastoid is the combination of spt. armoraciae comp. 3*ii*, chloroformi 3*ii*, tinct. aconiti 3*ii*, tinct. capsici 3*ii*, spt. camphore 3*iv*. This is useful in neuralgic pain of the meatus and tympanum. Messrs Corbyn have made for me a linimentum sinapis co. (containing belladonna and aconite), which is excellent as a rubefacient for the mastoid.

Sedatives.—In neuralgic attacks of the tympanum the bromide of ethyl (hydrobromic ether) as recommended by Turnbull, in the proportion of equal parts of water, glycerine, and hydrobromic ether, may be placed within the outer ear, on cotton-wool, and renewed occasionally. I can testify to the relief given by a 10 to 20 per cent. solution of cocaine in similar conditions, and indeed as a local anaesthetic in all painful states of the external and middle ear cocaine has no equal. For pain in the meatus and tympanum the syphon douche of warm

laudanum water, and the steam of same, are soothing adjuncts to other treatment, such as the subcutaneous injection of morphine or cocaine. But perhaps the most efficacious remedy in neuralgic pain of the tympanic nerves, often associated with similar pain in the trigeminus or facial, is the application of the constant current over the mastoid and auricle, and in the course of the fifth nerve. It is not to be forgotten that such pain is occasionally reflected and associated with various systemic states (hysteria and anaemia), and at times may have its source in dental caries. In some such patients massage of the face and neck muscles will afford relief. In assuaging pain and in the treatment of inflammatory attacks, the application of heat and cold may be resorted to. Generally warm anodyne fomentations are the most effectual and the safest.

But in the incipient stages of otitis externa, periostitis of the mastoid, and myringitis, cold, the degree of which is regulated by Leiter's refrigerating aural tube applied both to the auricle and around it, may assuage pain and abort the inflammation. By means of this

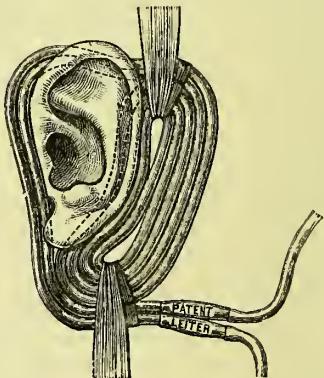


FIG. 95.—Leiter's Temperature Regulator.

regulator, special forms of which can be obtained for the ear, warm or tepid applications at any temperature can be maintained. They will be found useful in relieving the pain of inflammation either in the auditory meatus or the tympanic cavity.

CHAPTER XI.

AFFECTIONS OF THE EXTERNAL EAR.

ECZEMA OF THE AURICLE AND MEATUS—ERYSIPelas OF—OTITIS, EXTERNA, ACUTE, AND CHRONIC—FURUNCULUS AND ABSCESS—RECURRENT ABSCESS OF THE MEATUS—ABSENCE OR EXCESS OF CERUMEN.

ECZEMA.

WE are constantly consulted for eczematous states of the auricle. In practice these may be divided under two heads. There is the simple eczematous eruption in children, especially present in connection with the exanthemata and whooping cough, and which, in strumous subjects so frequently attends various catarrhal states of the meatus and tympanum. A child with phlyctens on the conjunctiva, or some form of catarrhal affection of the eye, comes with an eczematous state of the ear and face or scalp. The child is characteristic of its class; there is a general anaemic and debilitated appearance, with the peevishness and irritability of temper which are usually present; parents try to soothe with sweets, cakes, and all sorts of trash; the result is, that at hospital we generally see children of this type of constitution with the accompaniment of sweets, cakes, or fruit. Hygienic defects, and all the attendant evils help out these eczematous states. This form of eczema differs in no way from the similar disease which attacks other parts of the body. It is easily recognised by the discharge and the crust which forms. The cleft between the auricle and the mastoid process is often the seat of an irritating discharge, the surrounding skin is excoriated, and with difficulty can we examine the raw mucous surfaces. The disease may attack the meatus—the auditory canal is filled with a collection of epidermic scales, muco-purulent discharge, the glands about the mastoid process in the neck are enlarged.

In persons advanced in life we find the meatus occasionally the seat of a dry, eczematous desquamation. There is itching and irritation of the canal, rarely discharge; the auricle is sometimes swollen and sensitive, and the ear passage

is filled with masses of dry epidermis, and some epithelium. These collections, added to the swollen condition of the skin, cause deafness. If the meatus is neglected the membrane sooner or later becomes affected, appearing dull and thickened, while there may be considerable difficulty in removing the tenacious and adherent layers of dead cuticle which cover its surface. Such persons frequently come and affirm they have “gout in the ear,” and have resigned themselves to the intractable nature of the affection.

In nearly all these cases there is some constitutional cause for this local affection that should be looked to. In adults there may be a gouty temperament, free living, disorders of digestion; in children worms, dirt, or general impoverishment of the blood in a leukæmic temperament. The crusts should be softened and separated, first by oil packing at night (a few pieces of soft linen rag soaked in oil, and covered with oiled silk or gutta-percha tissue), and, after a few days, the exposed surface may be treated with some mild stimulating astringent ointment, such as lanolated benzoate of zinc with carbolic oil and vaseline, or liq. carbonis detergens and liq. plumbi diacet. and vaseline, or a little of the ordinary calomel wash. If there be much discharge, particularly if the skin between the attachment of the auricle and the mastoid be raw and moist, a lotion of calamine and oxide of zinc in rose water, applied during the day, the powder being allowed temporarily to dry on the part, will be found useful (see Formula).

At the same time the internal administration of mild alteratives, with such tonics as cod-liver oil and iron, or mineral acids, is indicated. The internal administration of a few drops of liq. arsenicalis with the meals has often the best effects. But the essential element

in the treatment consists in the attention paid to the diet and general surroundings of the patient. Simple and plain food, plenty of milk, and a little oatmeal in the mornings, with the avoidance of all trashy stuffs, attention to the cleanliness of the child's person, with sufficient outdoor exercise, should be the directions to parents.

By far the most troublesome variety of ulceration of the auricle is that which results from a chronic form of eczema, in which a thick and hard scab forms over a most inveterate and highly ichorous discharge. This crust clings with great tenacity to the part, and is with difficulty removed. When it is removed, the fluid which lies concealed by the scab is nearly transparent and straw-coloured. The entire helix is involved, and the ulceration extends so deeply that there is a loss of substance, and perhaps permanent

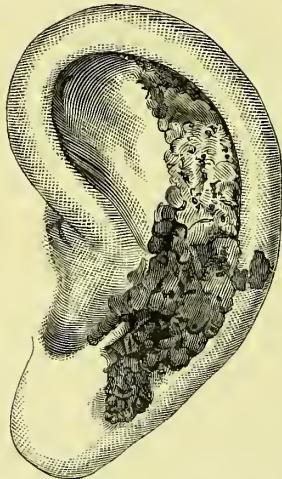


FIG. 96.—Auricle of Patient suffering from Inveterate Eczema.

disfigurement of the lobe. I have had three such cases under my care. In one there remains considerable deformity, from a long-continued and oft-recurring attack of the kind above described. The auricle is marked with permanent scars, or (as in the case represented in fig. 97) is destroyed in parts. Various remedies had been used, but with no ultimate benefit. I was consulted when the deformity was considerable. The treatment I have pursued in these cases is much as follows:—Complete removal of the scab by scraping, and thorough cleansing of the raw surface, which is then touched

with either chromic acid or carbolic acid lightly. This removal of the scab is repeated as it forms, and the acid is very gently reapplied. The patient may himself use a lotion of calomel and lime water after a few days, and smear a

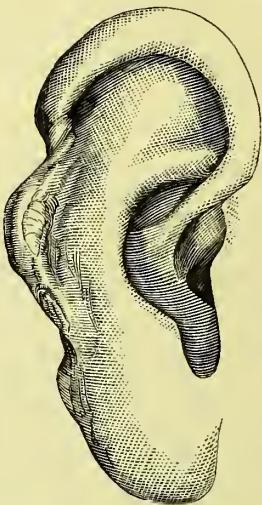


FIG. 97.—Auricle of Patient who had suffered for years from recurrent attacks of same affection; drawn after complete healing of the ear, showing the existing deformity.

carbolised zinc and vaseline ointment to the part at night. A few applications of the acid are generally sufficient, and then the chloride of zinc (gr. xxx. ad $\frac{3}{i}$.), applied after the removal of the scab, acts admirably. The crust should be removed daily, and the raw surface dressed.

The general health, at the same time, has to be attended to, and the internal use of arsenic and iodide of potassium may with benefit be prescribed. Often in eczema and in psoriasis of the scalp the meatus is filled with cakes of loose epithelium, which block up the passage, impair the hearing, and produce in time alterations in the membrane. These should be constantly and carefully removed by syringing and forceps; the passage must be well cleaned out with cotton-wool, and chloride of zinc with glycerine, or better the saturated boracic acid and alcohol solution. Nitrate of silver solution (gr. xx. ad $\frac{3}{i}$.) acts well when applied to the cleansed wall of the meatus. Of late I have used the chaulmoogra oil, combined with almond oil, in a pack, or applied it combined with lanolin and

oleate of zinc in many cases of eczema, in the latter stages of the disease (see Formula).

Warts.—Troublesome warts occasionally grow on the auricle; these are best dealt with by ligature, and their growth prevented by acid nitrate of mercury applied cautiously to the wart when the ligature separates. I lately removed a very large arterial wart fed directly by a considerable sized vessel, but in consequence of too early separation of the ligature, some severe haemorrhage occurred, which was easily restrained by a compress. In a case of epithelioma of the auricle in the person of an otherwise healthy farmer, in which I proposed removal of the part affected, the patient refused, and I am aware that, up to the time of his death, which occurred from another cause shortly after, the disease increased and involved the entire helix. But epithelioma having its origin in the auricle is comparatively rare, and the prudent treatment, if the disease be seen early, is the knife. A few cases I have treated most successfully by shaving off the growth, and then applying paste of caustic potash and chloride of zinc. An example of scirrhus I have never seen.

how still more frequently the tympanic membrane and middle ear are attacked.

Thus the site of the inflammation, or its extent and limitation, influence its character and course. If the osseous canal be specially involved, there is greater pain, often complete occlusion, the subjective symptoms of deafness and tinnitus are intenser, the course of the disease is more tedious, the middle ear is more likely to be affected, and the hearing permanently influenced.

The local signs of diffuse inflammation are characteristic of it, and can hardly with care be mistaken for any other affection, save the more circumscribed form of abscess or boil. There are present, from the first, pain, sense of heat, throbbing, tinnitus, some deafness. On examination of the ear there is perhaps some redness of the auricle, with general sensitiveness of the whole external ear; the patient shrinks from the touch of the speculum; the ear passage is swollen, the walls of the meatus are red, and appear to touch each other, preventing any view of the membrane. For some days there may be no discharge, or only some sticky secretion closing the small aperture between the swollen walls. Then follows some discharge of serous, sero-sanguineous, or purulent secretion, generally mingled with débris of shed epidermis. Still the pain continues, recurring with fresh severity on each accession of the inflammation, and is particularly bad at night. There are generally some constitutional symptoms attendant on the attack. The pulse increases in frequency, the tongue becomes coated, there is loss of appetite, the disinclination for food being further increased by the pain experienced from the movement of the jaw in eating.

The progress of the disease and its subsequent course will in great measure depend on the local treatment the patient receives, and the severity of the attack. Too frequently it is tedious, and runs into the chronic type of the affection, some swelling and erosion of the canal walls continuing, with purulent discharge, and more or less involvement of the tympanic cavity, and possibly perforation of the membrane.

Recurrences of the inflammation also are apt to take place, causing a renewal of all the symptoms (see Recurrent

OTITIS EXTERNA, ACUTE AND CHRONIC.

Diffuse inflammation of the external ear of the acute type is induced by the same causes that contribute to produce the more circumscribed attack of furuncle or abscess. In addition to these we may especially mention sea-bathing, the exanthemata, the presence of foreign bodies, and imprudent attempts to extract them; the strumous diathesis, gout, syphilis, diabetes, otomycosis, aspergillus (see remarks on the Etiology of Aspergillus, Furuncle, Recurrent Abscess, Otomycosis). Diphtheritic inflammation is extremely rare.

Course and Symptoms.—The inflammation once excited spreads rapidly, and may extend from the dermal layer of the meatus to the periosteum of the osseous portion. We have already considered the continuity of these structures with the tympanic membrane and cavity. This continuity of structure explains how in very severe cases the osseous canal may become involved in the inflammation, and necrosis or caries result, and

Abscess in the Meatus). When the disease has pursued its course unchecked there remains very often a granular state of the mucous lining of the meatus and tympanum, and possibly small vascular polypi. Still further the mastoid cells may be attacked, and inflammation spreading to these, mastoid abscesses, caries or necrosis may ensue, or in the worst cases meningitis, inflammation of the brain, and pyæmia.

CHRONIC OTITIS EXTERNA.

This is commonly the consequence of the acute disease. It is from the concurrence of chronic otitis media and suppurative discharge from the middle ear, with otitis externa, that we have the latter trouble so often confounded with the former in practice, and both jumbled up under the terms of otitis and otorrhœa.

In the chronic affection various conditions of the external meatus and middle ear are met with. There are collections of pus and epidermis in the canal, which is more or less contracted, sensitive, irritable, and denuded of its epidermis in parts. The tympanic membrane participates in the chronic inflammation, loses its lustre, is thickened and often perforated. Other appearances are similar to those found in otitis media.

Prognosis.—The prognosis will be in great measure dependent upon the means of treatment adopted in the early stage of the disease, and on the subsidence of the acute symptoms. Also, it will depend on the degree to which the disease has extended both in the external meatus and middle ear. If perforation occurs so that the ossicles are implicated the hearing must permanently be affected.

If the inflammation extends to the mastoid cells, or destroys the roof of the tympanum, then the case is of a most grave character. On the other hand, with early and judicious treatment and continued care of the ear, in the great majority of cases the patient recovers, if not perfectly, with but slight permanent results.

Treatment.—Much that is said of the treatment of furunculous inflammation and recurrent abscess of the meatus applies equally to otitis externa (see chapter on General Therapeutics, also Treatment of Furuncle and Abscess). Depletion by

leeches, the artificial leech, the use of Leiter's tube to the ear, frequent anodyne fomentations, mild, astringent, and antiseptic warm douches, the internal administration of salines, and some alternative, with careful attention to diet, including the avoidance of alcohol, are the principal means of combating the inflammation. The patient should be seen daily and the external meatus examined. An incision may have to be freely made into the swollen tissue, and this is the more necessary if we have reason to believe that pus is concealed. The same remark applies with additional force to inflammation of the osseous portion of the canal.

For the remaining management of the case the reader can turn to the directions for the treatment of furuncle of the meatus and abscess, stenosis (chapter on Hyperostosis), and chronic suppuration of the middle ear.

FURUNCULUS AND ABSCESS IN THE EXTERNAL MEATUS.

Both ordinary furunculus and more severe abscess may occur in persons of all types of constitution, and often in those who enjoy robust health, and at all ages, though various degrees of circumscribed inflammation are more commonly observed in those who from any cause are debilitated and enfeebled in general health.

Causation.—We find among the most common causes of abscess exposure to cold, injuries, irritation of the meatus from foreign bodies, "picking at" the ear with pins or other pointed bodies, collection of wax, with attendant inflammation of the cutis.

Symptoms.—The association between the occurrence of furunculus and abscess and the season of the year, malaria, and the presence of bacteria is referred to fully in the chapters on Etiology and Hygiene. The symptoms are characteristic—severe pain in the ear, of a shooting nature, increased at night, with some slight attendant fever and constitutional disturbance. Accompanying these symptoms there may be some deafness and tinnitus. This pain is of a radiating character, extending to the side of the head, and aggravated by movement of the jaw in eating. The entire ear

becomes sensitive to the touch, the patient shrinks from examination. The abscess may occupy any portion of the canal, and vary in size from a minute boil situated on some part of its wall, to a considerable swelling which may block up the entire meatus. The intensity of the pain and the symptoms vary according to the situation and extent of the inflammation: whether it be restrained by the bony boundary of the canal and in proximity to the membrane, or seated more externally in the cartilaginous portion.

Diagnosis.—The presence of the abscess is easily recognised. It is not often necessary to use any speculum, and this should be avoided, if possible, as its employment causes unnecessary pain.

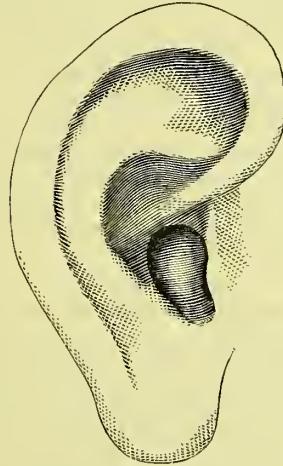


FIG. 98.—Abscess in External Meatus.

The meatus may be entirely closed by the swelling. This gives rise to a possible source of error, yet one which with any degree of care should never be committed.

I have found it difficult to persuade a medical man of some experience that such a case was not one of polypus. I have known an instance where an attempt was made to snare an abscess in mistake for a polypus. It is needless to say that with a little care, and if any doubt exists, on examination with a probe, such a mistake could not result. The complete continuity of the abscess with the wall of the meatus immediately distinguishes it. It is rare for resolution to occur, and generally in periods varying

from two to six or eight days, pus forms and is discharged.

Treatment.—The treatment consists in depletion with leeches (two or four) applied over the tragus or in the meatus, and in the early stage of the disease warm fomentations, such as a decoction of camomile and poppies and hot laudanum water, or the ear may be periodically steamed. The syphon douche can be used to douche the ear with. Maw's aural douche and one of Savory & Moore's answer the purpose admirably. Hinton and Roosa caution against the use of external poultices, the latter recommending a small conical linseed poultice introduced into the ear. It is well to emphasize this caution. I have seen great harm done by the continued use of

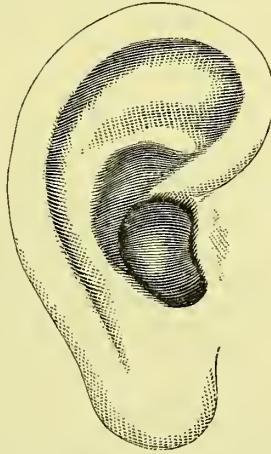


FIG. 99.—Polypus protruding from Meatus.

large poultices applied to the ear. The small conical bag of linseed is the kind I generally employ. Sometimes benefit may be had from an application of the liquor epispasticus over the mastoid process in the early stages. Often vesication is of great use in allaying the pain, also subcutaneous injections of morphia, or the free use of cocaine to the part. If the meatus be not blocked up, warm injections of carefully strained poppy water, frequently repeated, will be found grateful. When the abscess has formed, the early evacuation of pus, by an incision carried well into it, is the only treatment, this incision being followed by careful attention to the meatus and membrane. On this latter point it is not possible to speak too strongly.

Many are satisfied with the relief they give the patient with the first incision, and do not continue their care of the canal for some time subsequently. The result frequently is occlusion of the passage, with some epithelium and discharge, perhaps a recurrent abscess, or the implication finally of the membrane. The meatus should be well cleansed daily with a mild astringent and disinfectant lotion, such as boracic acid, sulpho-carbonate of zinc, or borate of soda, and weak bichloride of mercury, with glycerine (used warm), for several days (see chapter on Therapeutics and Formula).

It is better not to trust this treatment to the patient. After the meatus is washed out, it should be gently dried with the absorbent wool, and then the walls lightly wiped with a saturated solution of boracic acid in water and alcohol.

RECURRENT ABSCESS.

As abscesses are particularly likely to recur, it is well to warn the patient of this tendency, and so avoid the unpleasantness which sometimes arises from impatience at the prolonged nature of the inflammation. It is in these recurrent cases that the continuance of poulticing does such mischief, relaxing the parts and maintaining a chronic state of congestion of the vessels.

Weber-Liel rightly insists, in the case of abscess of the meatus, on early and free incision down to the periosteum. Thus the morbid process is shortened. He recommended a spirit bath of alcohol and weak solution of bichloride of mercury in the commencement of the inflammation; the patient lies on the side and the ear is filled with the alcohol. This has a hygrometric and anaesthetic effect. A 5 per cent. solution of carbolic acid (2 to 4 drops) is injected subcutaneously into the furunculus. This lessens the tension and pain. The alcohol bath is then used for one hour. The injection is repeated if necessary, only a fresh and pure solution of carbolic acid should be used. Pain is thereby arrested; the inflammatory process is cut short and recurrence anticipated.

At times abscess in the meatus assumes very formidable proportions. This is particularly so in those cases where there

is frequent recurrence of the abscess. A patient for some time attended me who came with the meatus completely closed with small multiple abscesses. On opening and reopening of these the inflammation subsided, and an enormous quantity of cerumen and epithelium came away, the membrane being perforated behind the mass. Another patient had suffered for several months with abscess of the meatus before consulting me: the inflammation extended to the mastoid cells and tympanum, periodical attacks of violent pain, redness and swelling of the mastoid and the parts above the auricle supervened, and then a copious discharge of pus took place from the meatus. On and off these attacks were attended with alarming constitutional symptoms—violent headache, coated tongue, exaltation of temperature, rapid pulse, and sleeplessness. On the escape of the pus all these symptoms subsided. I believe that all the mischief in this case arose from the want of a free incision in the first instance, and the imprudent and prolonged use of large poultices. This gentleman died, I learned, about one year after I attended him, of cerebral inflammation; no autopsy would be permitted.

ABSENCE OR EXCESS OF CERUMEN.

The healthy secretion from the follicles of the meatus varies greatly in different individuals, both in quantity and character. In some it is very soft and oleaginous, in others it is dry and has a tendency to crumble. The colour also is different, varying from a pale yellow to black. It may be mixed with hairs, or portions of epidermis. With the dry forms of secretion we often find eczematous conditions present.

Absence of Cerumen.—There is no doubt that the popular notion that a “dry ear” is indicative of deafness is, generally speaking, true. We find this dryness of the meatus and absence of secretion frequently present in those who suffer both from middle ear catarrh and accompanying affections of the labyrinth. It is more commonly observed in old persons. It may be indicative of some morbid condition of the trophic nerves of the ear (Politzer). Certainly it is a frequent accompaniment of catarrhal appearances of the membrane and ossicles,

and is often present in obstinate cases of tinnitus. Its disappearance, and the secretion of wax, is occasionally noticed, not necessarily with an improvement of hearing. Some emollient application, as glycerine, white vaseline, or an alkaline lotion, may relieve the sense of dryness or itching.

Excess.—Excess of wax deserves special attention on the part of the surgeon, as it is so common a cause of deafness, and is so frequently found complicating other pathological changes in the ear.

Causes.—It may be attendant on a narrow external orifice which favours its collection. While writing these lines I am treating a lady, who has returned from India, with cerumen in both ears. A surgeon recognised the presence of the wax, but failed to remove it. On examination I found the external orifice extremely small, and the wax hard and impacted in the canal. After considerable trouble, by syringing with warm alkaline water, and the use of the lever forceps and aural probe, I removed it from both ears. The masses were coated with dead epidermis, and the walls of the meatus were red, and in portions stripped of epithelium.

The use of towel ends and various "picks" for the ear favours the collection and impaction of wax. Imperfect cleansing of the ear after the free use of soap in washing is another cause of the collection of wax. This inflammatory state of the meatus is often seen with cerumen, so much so that we may look on a chronic form of dermatitis, as both a possible cause and sequence of excess of cerumen.

Diagnosis and Symptoms.—The symptoms complained of by patients suffering from "wax in the ear" are that of deafness, with a stupid feel and some form of tinnitus. It is well to insufflate a patient with the aural bag a few times after the removal of wax. Most ridiculous errors are often committed from overlooking this simple cause of deafness (see chapter on Diagnosis).

Nothing can be more exasperating than for a patient to return a long distance to a surgeon, and find that the source of all his blistering and leeching, and perhaps physicking, lay in a mass of easily removable wax; yet this occurs. The characteristic black shining surface of the wax

can hardly be mistaken, with any degree of care. The surface of an old and hard mass of wax sometimes has a peculiar lustre, and may give to the inexperienced eye the idea that it is the membrane, but it is only necessary to mention this, in order to prevent any surgeon from falling into so unfortunate an error. Two imprudent practices patients should be cautioned against;—the habit of inserting picks, rolls of towels, &c., into the ear, to cleanse the meatus, which can only do harm and ensure the consolidation of any cerumen in the canal, and its impaction on the drum, and the fashion of placing cotton-wool in the ears.

The presence of wool is frequently overlooked. Remaining in the meatus it collects secretion, and may be hidden by wax, or if there be any discharge it may become imbedded in it. The necessity for the wool after syringing or on going out into the cold air is obviated by placing one of my aural protectors in the meatus. It will be sufficient to mention that not long since I removed three layers of wax and two of cotton wool from the ear of a gentleman who was completely oblivious of the presence of the wool.

Treatment.—Free syringing is generally all that is required for the removal of this common and troublesome cause of deafness. The mass may not come away until a considerable time has been spent in syringing. This more frequently occurs when there has been some inflammatory action in the meatus, or that the shed epidermis which envelops the cerumen is adherent to the wall of the passage.

The removal of a plug of impacted wax is often expedited, after syringing a little time, by carefully grasping the mass with the rectangular or lever forceps, and thus withdrawing or loosening it. A little liquor potassæ and glycerine dropped into the ear for a few nights will help to soften hard masses of wax and epithelium.

After a portion has been removed, and while the grub of cerumen or waxy cast of the meatus is being washed out, the canal should be from time to time examined with a speculum; much harm may be done if this step be not attended to, as the healthy membrane may be forcibly syringed on and injured. On the removal of cerumen, the membrane has

generally a dull appearance, with an absence of transparency, and the surface of the malleus has an injected look ; the collection being removed, an interval of a few days will generally set things to rights, and if this be the sole cause of the symptoms, nothing further is necessary. If any tinnitus or pain persists, or if the deafness is not relieved, we must suspect other mischief, and proceed to examine the ear closely.

Insects in the Meatus.—Should an insect find its way into the meatus, the best thing to do is to pour in a little warm oil or glycerine, with some alkali, as potash or soda, so as to suffocate it, and then it can be washed out with a syringe.

Erysipelas of the Auricle.—Sometimes this affection assumes formidable proportions, occurring either in connection

with erysipelas of the scalp, or as a complication of some other aural trouble, rarely ideopathically. I have just had a case of erysipelas of both auricles occurring in connection with a slight ectymatous attack of the head and face. First one auricle was attacked, and then the other, finally the inflammation spread to the scalp. The treatment does not differ from that of erysipelas elsewhere. The deafness that accompanies the disease disappears on the subsidence of the swelling. The meatus must be kept as clear as possible ; some fine powder of equal parts of starch flour and oxide of zinc, kept to the part, with gauze over the skin, or fine muslin ; or, if it be preferred, an application of equal parts of mild mercurial ointment and vaseline. The general health should be well sustained, and tincture of iron administered.

CHAPTER XII.

AFFECTIONS OF THE EXTERNAL EAR—*continued.*

POLYPI—HYPEROSTOSIS AND EXOSTOSIS—ATRESIA—FOREIGN BODIES—ASPERGILLUS AND OTOMYCOSIS—OTHÆMATOMA.

POLYPI.

POLYPI are found growing from the tympanum, more especially its posterior wall, from the meatus, and from the tympanic membrane. This order of growth corresponds with the relative frequency of the seat of the polypus.

Pathology.—They are either mucous, fibrous, or myxomatous. The first named is composed mainly of a homogeneous stroma, in which are round cells enclosed in a fibrous framework (Politzer). In their interior may be found cystic spaces lined with epithelium. They are rich in vessels. The density of the growth depends on its gradual conversion of the round cells into fibrous elements. The fibrillar nature of the fibrous polypus distinguishes it, and it is not so vascular as the mucous. True myxomatous polypi are exceedingly rare.

Those polypi which grow from the membranous and tympanic cavities are very vascular. They occur as the result of otitis media and chronic suppurative states of the middle ear. Polypi vary in size from that of a large mass which completely fills the meatus, and protrudes from it to a small growth, which it is difficult to seize with the forceps.

Polypi may be multiple, several existing in one ear, and we may find them in both ears. There is often a considerable discharge of pus, which obscures the polypus, on the removal of which with a syringe the polypus comes into view. There is not necessarily pain during their formation, and the characteristic symptoms are deafness with a discharge, which is occasionally mingled with blood. Those springing from the deeper portion of the meatus, or just in front of the membrane, frequently conceal a perfora-

tion of the latter. (See chapter on Cleanliness.) The dangers arising from the neglect of aural polypus are elsewhere referred to.

Treatment.—If the polypus is of larger size, globular or pyriform in shape, of the fibrous or fibro-gelatinous kind, we must resort to other means of removing the mass. It is well in these cases to determine as carefully as possible before operating, the size, mobility, and seat of attachment of the polypus. This, as a rule, can be readily done with a probe. Most of the globular polypi which fill up the meatus are easily removed, with the ordinary small curved polypus forceps; but the best instrument is the polypus snare of Wilde—the only difficulty which we meet with is the careful noosing of the polypus close to its attachment.¹ This, however, is seldom a matter of difficulty, and will be found less so if wire strong enough for the removal of the polypus, at the same time that it can be easily moulded so as to encircle the mass, is used.

I have tried various wires for the removal of polypi. I prefer thin copper or iron wire if the growth is large and hard. Thin wire or fishing gimp can be used in ordinary cases.

For operating on small vascular growths, either the rectangular ring forceps or the lever ring forceps is the best to use. This latter instrument is admirably adapted for this purpose.²

Free syringing will bring away any loose portions of polypus not removed by the forceps. I have never had any haemorrhage to speak of after removal of any kind of polypus. I generally use a little very hot water if the bleeding is severe, and this is, as a rule, sufficient to control it. Occasionally it is not possible to remove the entire of one of these vascular polypi at one time, and we have to operate three or four times before the growth is cleanly extirpated. But the mere removal of these troublesome growths is only the first step in the process of cure. It requires often considerable forbearance on the part both of the patient and surgeon to follow up the

treatment. Periodical touching of the exposed surface with some caustic is required, as well as the thorough cleansing out of the canal. Having wiped the raw surface with cotton-wool, used with the armed aural probe, then the site of the polypus must be lightly touched with a fine pencil of wool rolled on the point of the probe, and moistened with chloro-acetic acid. The crystallised acid is readily converted into a fluid state by the addition of a little water. We may also use nitrate of silver, carbolic acid, chromic acid, and alcohol with glycerine or perchloride of iron. But after a fair trial of many agents, I prefer the chloro-acetic acid to any for this purpose. One rule should be adopted in every case; no one should be satisfied as to the cure of the disease until all discharge has ceased, and the surface from which the polypus has sprung presents a healthy appearance.

The neglect of polypi may lead to the most serious consequences. On two occasions I have seen death with brain complications following on aural disease that was associated with the presence of a large polypus in the meatus. In both cases the symptoms of cerebral abscess were present. I saw the cases when the removal of the polypus was too late to avert the mischief. Such cases should act as a warning to practitioners not to simply pull away a polypus with a forceps or snare, and then send the patient home with the idea that he is cured, only giving him some simple lotion to keep the ear clean with. The polypus regrows, perhaps the patient has the growth again torn away, or partially torn, as happens in many cases, and he now thinks it useless to apply for relief for that which is certain to return. And so he is satisfied to let things as they are until some formidable symptoms are induced by the growth and the discharge. All this is the result of want of subsequent attention to the remains of the pedicle of the polypus or the granulations that remain after its removal.

Whenever a polypus is removed the patient should have impressed on him the necessity of a prolonged attendance or an occasional inspection of the ear subsequently, in order to prevent its re-growth, and also to get the meatus or other seat of the disease into a healthy condition.

¹ See chapter on General Therapeutics for the description of the snare of Wilde, and the lever forceps, and the method of using these.

² For description of these instruments and the method of operating, see page 70.

HYPEROSTOSIS AND EXOSTOSIS.¹

Tumours of the nature of a hyperostosis (a hyperplasm) or exostosis (a new growth) may occlude the auditory meatus, and if they grow to any size may cause deafness and tinnitus; while if there be any inflammation of the tympanum or catarrhal discharge, they may cause retention of secretions in the auditory canal or tympanic cavity.

The exostosis differ little from osteomatous growths from the periosteum occurring elsewhere, varying according to the degree of density of the newly-formed osseous tissue. Field reported the microscopic features of an exostosis removed by him. It was of the nature of "a spongy osteoma," as defined by Cornil and Ranvier. In the substance of the tumour the osseous trabeculæ were filled with medullary tissue. The superficial layer of bone was denser than the central. A polypus (Kramer) may be converted into a form of exostosis or stalactite, while suppuration of the softer varieties may occur, and the looser central tissue may break down into pus.

Cassells well differentiated exostosis from hyperostosis. This comparison of

the two growths fairly corresponds with the views of observers on the Continent and in America. It is often difficult in practice to define the one from the other. Hyperostosis, as Tröltzsch remarks, is more diffused, and exostosis more circumscribed.

"Hyperostosis is never seen till the osseous meatus is completely ossified; exostosis appears before the complete ossification of the meatus. Exostosis is found arising from a point near the junction of the osseous canal with its cartilaginous portion; hyperostosis is seen only in the inner, or osseous end of the external auditory canal. Hyperostosis is always conical in shape, never pedunculated; in exostosis, on the other hand, there is always a pedicle, and its shape varies. Hyperostosis is of ivory hardness; exostosis, before complete ossification has taken

place in the tumour, can be pierced to a varying depth. Hyperostosis is not movable on pressure; exostosis is slightly movable, even when complete ossification has taken place. Hyperostosis is often seen without any other disease of the ear, and if an ear disease exists, there is no causative relation between them; they exist altogether independently, and apart from each other. Exostosis is nearly always complicated with another affection of the ear, past or present. Hyperostosis, therefore, may exist in the meatus with normal hearing. Exostosis, on the other hand, is almost always attended by a defect in the hearing. The deafness which accompanied hyperostosis, in the absence of any other disease of the ear, is due to the size of the growth, and is mostly mechanical, or it is due to the presence of débris between or behind the tumours. In exostosis the defect in the hearing may also be mechanical; this defect, however, is generally due to ear disease, either past or present."

These tumours frequently occur without any assignable cause.

Politzer thus enumerates the common causes of exostosis:—(1) Partial hyperplasia during the stages of development and ossification of the osseous meatus, with these he classes the symmetrical (bilateral) varieties of exostoses; (2) circumscribed chronic periosteal inflammation in the osseous meatus; (3) diffuse inflammation of the meatus (with or without otitis media); (4) heredity; (5) syphilis and gout. They have been specially observed in the skulls of some of the aborigines of North and South America. They may be congenital. With care exostoses cannot be mistaken for any other swelling occurring in the auditory canal. These growths are hard and painless, though occasionally very sensitive to the touch of the probe, and only produce uneasiness from the deafness that gradually increases, and which frequently is sudden in its onset from the complete closure of the passage with cerumen, or other collection of pus or epithelium. This is more likely to occur when there has been a chronic otitis externa or a suppurative catarrhal state of the middle ear. The skin covering the growths is perhaps slightly pinker than that of the meatus; at other times the reverse is the case, the integument being quite white.



FIG. 100.—Hyperostosis in Front of Large Perforation of Membrane.

¹ See Plate I.

The drawings of exostoses in Plate I. were taken from the ears of a medical gentleman advanced in life, who came to me quite deaf from occlusion of the meatus.

In this particular instance a cause was present with which the occurrence of exostosis has been associated. He was in the habit of bathing and diving in the sea. For twenty years, winter and summer, he bathed, and often twice and even three times in the day in summer time.

Referring to the classification of aural diseases met with in the 2000 patients tabulated by me in hospital and private, it will be noticed how comparatively rare is the occurrence of exostosis. Still more seldom do we meet with complete occlusion of the canal or such an extent of growth that the hearing is seriously interfered with by the exostosis alone. If the patient be deaf, the deafness is frequently the result of some superadded or coincident aural affection.

Treatment.—It is wonderful how much we can effect without resorting to the more formidable steps of drilling or gouging the exostosis. I have had several patients with exostosis in which a mere chink existed, now hearing well, and with a permanent opening, in whom no treatment was adopted save the constant dilatation of the contracted canal (with Bonnafont's dilators and laminaria) and the application with the aural probe, most useful for this object, of such astringents as chromic acid, nitrate of silver, chloride of zinc. In the extreme instance of exostosis in both ears, before alluded to, and treated on this plan, I have seen the patient frequently, and he hears perfectly. It should be remembered that a very small orifice in the meatus is sufficient for the conveyance of sound to the tympanum. With the aural probe, save in cases where the chink is very small, there is seldom any difficulty in cleansing the meatus behind the exostosis.

Surgeons may rely on the accuracy of the statement that if they only interfere by operation on those cases in which the deafness and subjective symptoms depend on occlusion of the canal by exostoses, they will have but few occasions, if any, in a lifetime, in which they will require to use a dentist's drill or an aural gouge.

Should that occasion arise, either from deafness or the retention of pus in the tympanum, they must resort to the dentist's drill, so successfully used by several surgeons in the removal of such growths. It is a far safer method of operating, and more under control than the gouge.

The operation is a tedious one, demanding considerable caution, the progress of the drill being obscured by the haemorrhage it causes. A steel guard previously adapted to the meatus and exostosis is a considerable help (Field). Under any circumstances, it is an operation not to be resorted to save in extreme cases, and after placing the severity of its nature fairly before the patient. The galvano cautery may be used to enlarge the opening. The absence of bleeding is an advantage. The first essential for the surgeon to secure is the cleanliness of the meatus *behind* the growth. In effecting this he also secures the patency of the canal. If washing the meatus out with the ordinary syringe does not reach the canal behind the growth, if we desire to remove any débris of epithelium with cerumen which may be imprisoned by it, a little soda of potash solution may be syringed, with a fine catheter cut at the end, through the chink, which will soften the mass gradually, and facilitate its subsequent removal, either with the cotton-wool holder or by syringing.

The aural probe can be protected with wool and introduced daily, the wool being wet with such solutions as those of chromic acid (gr. xxx. ad 3*i.*), alcohol and boracic acid, carbolic acid and glycerine, iodine, chloride of zinc. By careful manipulation with the probe we can cleanse the cavity inside the aperture, the best solution for this purpose being that of boracic acid in alcohol and water. If the stronger applications are used for the strictured canal it is sufficient to apply them a few times in the week. But the patient can be taught to cleanse the opening daily with the aural probe. In one case of severe exostosis I have known Bonnafont's graduated metal dilators enlarge considerably the size of the stricture, the patient finding little discomfort from their use. But with sensitive growths the pain they cause generally renders their employment impracticable.

Atresia of the external auditory canal

is not commonly met with. Care must be taken that if the atresia is situated far in near the membrane, the aperture be not mistaken for an opening in the membrana tympani. A girl of 12 was brought to me in 1885 by the late Dr Cæsar of Shirley. She had a large opening in the right tympanic membrane, and both in the tympanum and on the membrane were vascular granulations. On cleaning out the meatus an aperture, which appeared at first sight to be a perforation of the membrane, was exposed. This on further examination proved to be the entrance to a canal in the osseous meatus which led into a cul-de-sac in front of the membrane. There was no evidence of perforation. Dr Beaumont of Shirley, Dr Cæsar's successor, has had charge of the case since, I seeing her periodically. The polypoid condition has been long since cured, and by assiduous dressing the minute aperture for the meatus of the left ear has been considerably enlarged, the girl now having quite useful hearing. In treating any of these cases of atresia the same course of treatment must be resorted to as recommended in stenosis of the canal from hyperostosis. We must ensure constant cleanliness and the gradual enlargement of the strictured part by the application of the aural probe. Seldom is operation justifiable.

Politzer uses the ear trumpet as an indication for operation in those cases of atresia due to cicatrical adhesions or membranous septa. When whispered speech is heard with the ear trumpet, recourse may be had to division of the septa, and an introduction of ivory or leaden pegs subsequently. In cases where speech is not heard through the ear trumpet interference is useless.

FOREIGN BODIES IN THE MEATUS.

Persons are yet to be found who can be rash enough to employ clumsy force and ill-contrived instruments in the removal from the external meatus of what often is, even after a prolonged residence, a comparatively harmless tenant.¹ Common sense and surgical instinct, guided by even a minimum of anatomical knowledge, might suggest how imprudent are such attempts to anyone who pauses to reflect on these simple considerations of

the anatomy of the external passage of the human ear.¹

In the *child*, the meatus is remarkably narrow; it is mainly cartilaginous; it is often congenitally contracted; its skin-lining is directly continuous with the membrana tympani, and is intimately connected with the periosteum of the temporal bone; it is close to the dura mater, and closer still when gaps occur in the osseous canal. In the *adult*, the canal is more spiral, the osseous portion is proportionately larger; but the entire passage may be described as a coiled tube, about an inch in length, consisting of two portions, situated almost at an obtuse angle to each other, the junction of the two being marked by a peculiar contraction, any further closure of which, in consequence of inflammation or thickening, completely shuts off the bony internal pouch from the external funnel.

From this it is evident that the direction of any extracting or expelling force must depend on the portion of the canal in which it is applied, and also that, having in view secondary consequences, and the effect of inflammation in frustrating our efforts to remove a foreign body from the passage, we should employ no force that is in the least calculated to excite this inflammation. The greater the swelling of the epidermis with subcutaneous cellular effusion, and it may be periostitis the greater the jamming of the foreign body, whatever be its nature. If it be hard and angular, this is more likely to occur than if it be smooth and round.

If it be pushed into the pouch in front of the membrane, and the latter be contused in attempts to catch it, the more likely are we to have inflammation of the membrane and resulting perforation, with tympanic mischief. If the canal becomes so swollen that the foreign body cannot be seen, and its removal be still attempted, then the effects of this "groping in the dark" are more disastrous; further inflammatory mischief and tighter jamming.

It may be conceded that, in the large proportion of cases, foreign bodies are fixed in the ear by attempts at removal. If the body does not occupy the calibre of the canal, it lies in it, and there is a

¹ See chapter on Etiology.

¹ See chapter on Anatomy and Physiology.

space for the expelling force to be directed from behind on to it.

If it be so large as to fill the entire calibre of the passage, which is rarely the case, it will, previously to being interfered with, in all probability lie loosely in the passage, its further entrance being arrested by the contraction of the wall.

In my experience, the most frequent seat of the arrest of a foreign body is at the junction of the cartilaginous and osseous portions of the meatus. It becomes *arrested* here, or is driven against the membrane by extractive efforts. Every touch of an instrument, no matter how gentle, sends it further in: each forcible effort tends to further *impaction*. Of course, there are some bodies so small and so shaped that it is a matter of no difficulty to catch them with a forceps and withdraw them. It may be laid down as an axiom in aural surgery that, in the case of any arrested body in the meatus, where any space exists between the foreign substance and the wall of the meatus, the only agent which should be employed is water.

Many pages have been devoted to the consideration of this subject, and many opinions have been expressed as to the superiority of this or that method of removal, and the advantage of this or that instrument over others, whether scoop or forceps. My belief is, from several years' experience, that syringing is *the one* safe and certain method of removing foreign bodies from the ear. This is *the rule*; there may be some few and rare exceptions. I have, by careful, repeated, well-directed syringing, removed foreign bodies of all descriptions and shapes from the meatus by syringing alone. Only on rare occasions have I succeeded in removing a foreign body by syringing, and I have never failed with patience in the case of any patient brought to me; and I feel confident that, had I the further opportunity of giving to the syringe a fair trial, I would have found it equally successful. Amongst some of the substances I have thus removed, were glass beads of all shapes, shells, stones, pieces of chalk, berries, ears of corn, pieces of slate pencil, &c. I could fill pages with the history of cases of foreign bodies in which by syringing alone I have got rid

of the troublesome inmate of the meatus. If the body be impacted, or if it completely occlude the canal, much will depend on the nature of the body, its shape, the material of which it is composed, the length of time it is lodged, the presence or absence of inflammation, the kind of instrument at hand. It is my conviction that, in all recent cases, those quickly brought to the surgeon, syringing is the best means to adopt; in all cases where inflammation is not present, no matter how long the body lies lodged, syringing is also the best means; and, in cases where inflammation is present, I prefer, as a rule, to wait, using means to subdue it, with gently syringing daily; and, if patience only be exercised, success in the end is almost certain. The instrument suited for one occupant of the canal will be found valueless for another. The shape and the position of the foreign body are the two things which must be considered in the employment of any instrument. To avoid all force is the rule, never to be violated, let the circumstances of the case be ever so tempting.

The following few cases out of many constantly occurring to me in hospital and private practice, bear on the foregoing remarks, and illustrate some exceptions to the rule I have laid down regarding the syringe:—

Some years since a child was brought to me with a shell in the meatus, where it was quite visible. It was one of those small yellow shells common on the beach. The convex surface was directed outwards. It completely filled the meatus, and was jammed in the contracted portion. Many attempts had been made to remove it, but all resulted in driving it further in, and its smooth surface rendered it impossible to catch it. I advised patience and syringing. There were both pain and inflammation when I saw the ear. Some catarrhal discharge subsequently formed. The ear was syringed daily. In about three weeks from the time I saw the case, the unwelcome guest suddenly came out while the ear was being syringed.

A gentleman was tickling his ear with a programme-pencil while at a ball. In doing so, the bone top of the pencil remained in the ear. He fancied that he afterwards heard it fall out. Feeling,

however, uncomfortable the next day, he sought advice, and the practitioner whom he consulted thought he saw the white flat surface of the bone-cap. Several efforts to seize it were made, giving him great pain. On the following day, these were repeated. The passage now became swollen and painful, and another surgeon was consulted, who, without expressing any opinion as to the presence or absence of the foreign body, wisely abstained from all interference, and directed simple washing out of the ear, and leeches to subdue the inflammation. After some days I saw the patient. I found the passage contracted by the inflammation, so much so that no speculum could be inserted ; there was considerable pain and complete deafness. However, with the otoscope and Politzer's bag, I satisfied myself that the probability was against the presence of a foreign body ; but there was evidently a considerable perforation of the membrane. With care and treatment, he ultimately recovered, hearing the watch before he left me at twelve inches ; there remained a permanent perforation in the membrane. This case was the more serious, as the hearing in the other ear was impaired from childhood.

The use of scoop and wire noose is shown in the following case :—A child was sent to me from the country by two medical gentlemen, with a blue glass bead in the ear. The bead was diamond-shaped, and was taken from one of those "surprise packages" of sweets which are sold to children. The bead had been in the ear for several days, and resisted all attempts at extraction and syringing. The child was very restless, so I put her under the influence of chloroform, and tried syringing, but in vain. The smooth, diamond-cut, conical end of the bead was turned out, and it was fixed in the passage. Keeping the child well under chloroform, with assistance, I passed the sharp curved edge of a Critchett's cataract-scoop over the margin of the bead, between it and the wall of the meatus. I was thus able to slightly turn it on its own axis. This gave me room to pass a loop of silver wire over the margin of the bead (as originally recommended by Mr Hutchinson) and obtain a grip of it. But after two or three efforts, the wire broke each time, and there was not room to

pass a stronger wire behind the body. I, however, succeeded in getting a double loop of the thin wire over the edge, and finally brought it away.

Some years since a child was sent to me with a spherical glass bead in the meatus, which completely filled the calibre of the canal. I thought that forcible syringing might, in this instance, by driving the body further in, do more harm than good ; and, as the bead did not appear to be firmly impacted, and was not any length of time in the passage, I thought of Brunel's plan for the coin in his larynx. Accordingly, I turned the child on her side, with the affected ear down, and while in this position I placed the fleshy part of the thumb of my right hand (the body was in the left ear) over the opposite ear, the fingers being extended on the head ; the inner side of the palm of the hand thus came above the auricle, on the temporal and parietal bones ; by giving a few sudden jerks to the head in this position with the inner side of the hand, the bead dropped out.

A child was brought to me with a piece of chalk which she had wedged into the passage. Efforts had been made to extract it. The chalk had been partly broken down with the forceps, and there was no space available to pass any instrument behind the mass. I scraped away with a sharp scoop as much as possible of the chalk from the upper wall of the meatus, washing the débris away with a syringe. I then persevered in properly directed syringing, and the mass came away under chloroform.

A child with a smooth stone, rather angular in shape, was brought to the hospital ; the stone was inside the contracted portion of the canal. I tried syringing without avail. The stone, though it was not possible to get any extracting instrument between it and the wall of the meatus, was movable. I determined to wait and syringe. The child was troublesome. Several times I got him under chloroform, and examined the stone with a fine probe and good light carefully. I tried to catch it with cobbler's wax, but it would not come. I made an effort to fit the spoon behind it, but failed. It only went further in. Some inflammation setting in, and discharge appearing, I desisted from all

efforts, and merely had the ear washed with warm water daily, filling the meatus each time with glycerine. Gradually the stone worked its way out, until it was about halfway through the narrow part of canal. I was now tempted to try and get a wire behind it ; it only pushed the stone back. I, therefore, determined to do nothing but syringe. Some discharge continued. At the end of three weeks the stone came away. There was slight catarrh of the passage, but the membrane was not affected, and the child recovered with perfect hearing.

Sponge in the meatus offers an example of exception to the rule I have laid down as to syringing.

A gentleman came to me (1885) in severe pain. He was dressing for dinner, and in cleaning his ear with a small ear-sponge which he was in the habit of using for that purpose, the sponge had entered the canal, and, in attempting to remove it, he pushed it further into the meatus. Going to a surgeon, syringing was tried in vain, and in other efforts to remove the sponge it was forced down to the membrane, soon giving rise to pain and uneasiness in the ear. With the reflected light I could discern the sponge at the bottom of the canal. Grasping it with the lever forceps, it came away easily.

Having thus given the brief details of a few obstinate and difficult cases, I desire to quote these remarks of Hinton and Trötsch on this subject. The former says :—" I must be pardoned for speaking earnestly on this point. Even to this day it remains the fact that ears are thus destroyed without shadow of reason or excuse, and not by careless or incompetent persons alone. I believe it may be laid down as a rule that, whenever an instrument will succeed, syringing would also succeed ; and that, when proper syringing will not succeed, all instruments are full of danger ; if had recourse to before violence has been used, would probably, in all cases, remove the offending body in ample time to prevent mischief." " Injuries," says Trötsch, " are frequently inflicted on the soft parts of the meatus by patients with itching in the ear by means of knitting-needles or sharp metal ear-pricks ; graver and more serious frequently prove those contused and lacerated wounds of the

meatus inflicted by a professional hand, in attempting the removal of foreign bodies, even in those cases in which most harmless intruders, as morsels of bread and paper, are concerned. On such occasions, the instrumental foreign bodies are generally the chief part of the evil."

There can be no doubt that foreign bodies may remain a long time in the meatus, and produce no bad results. We should remember this fact in cases where patience is indicated, and where there is no need for active and it may be dangerous interference.¹

Finally, on this much debated question of the extraction of foreign bodies from the ear, I venture to give it as my opinion that *all* instruments are in a degree dangerous, to be employed with caution, and on no account should their use be continued until proper syringing has first been given a long trial. To syringe the ear, the lobe should be held well back, the head sideways, the face slightly up, and the stream directed with sufficient force so as to pass between the foreign body and the wall of the meatus. I fill the ear with glycerine after each syringing, and repeat the process daily. I have known a piece of cobbler's wax used with success to draw a foreign body out.

Glue applied with a camel's hair pencil (Löwenberg) and allowed to harden on the body has been employed. Dentist's cement may be applied with the same object. Quietness and firmness with friends, patience in using the syringe, extreme caution with all forms of mechanical helps, are the essentials for dealing successfully with foreign bodies in the ear.

Any form of extractor, no matter how ingeniously devised, should be taken in the hand only when the nature of the substance justifies the belief that we can lay hold of it or that by its position we can gently raise it from its bed.

ASPERGILLUS—OTOMYCOSIS.

Microscopic Appearances.—To Burnett of Philadelphia we are specially indebted for a clear description of the microscopic features of this fungus. On the Continent

¹ See the case of a grain shot which remained in the meatus from childhood, already instanced by the author, chapter on General Therapeutics.

many otologists, following Wreden and Mayer, have described the etiology of otomycosis, more especially of late years Pacini, Schwartz, Gruber, Politzer, Weber-Liel, Löwenberg. In America, Orne Green, and Rosa, and in England, Cassells have also added to our knowledge of these vegetable organisms. Burnett regards the *Aspergillus Nigricans* as the commonest variety met with, having himself never met with a case in which the *A. glaucus* was present, though the polymorphism of the fungus is asserted, and the varieties of the fungus are by some regarded but different stages of development of the same species.

Burnett thus describes the microscopic features of the *Aspergillus nigricans*, the figures in the text being from original drawings of Dr Burnett:—If a small piece of a colony, in the earliest stages of

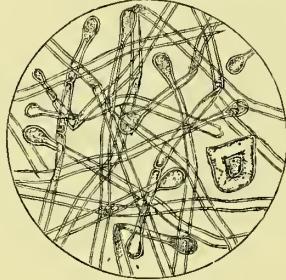


Fig. 101.

its development, be examined under the microscope with a power varying from 250 to 300 diameters, a field similar to that in fig. 101 will be observed. It is, in fact, the first formation of rootlets or the

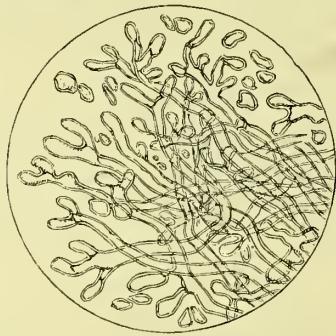


Fig. 102

mycelial web, from which, at a later period, the fruit-stalks or fructiferous hyphens spring. It will also be seen that some of the filaments composing the web tend to become bulbous at one end,

and that the latter, as the stem grows, becomes larger and dotted (fig. 102), until finally there is standing out from the dense web of mycelial filaments a perfect fruit stalk and a fructiferous head—the latter studded with short peg-like limbs, the sterigmata, on the free ends of which are the spores (fig. 103).

“ All of these stages of growth I have traced in specimens of the fungus removed from the human ear. In the fluid parts of the specimen, epithelium may usually be seen in small quantities, as the parasite develops, as in the upper part of fig. 102. “ Very rapidly, in the course of a day or two at most, the perfect fruit-stalk is formed in large numbers and in all stages of development, and the mycelial filaments can be seen to be coarser and septate. On one hand may be seen a well-formed though unripe fruit-stalk and head (fig. 103, b), while in the centre of the field there may be seen the ripe aerial fruit, from which the fully-grown spores drop literally in myriads (fig. 103, c). ”

“ The characteristic difference between the two varieties of aspergillus, the so-called *yellow* and *black*, is seen in the

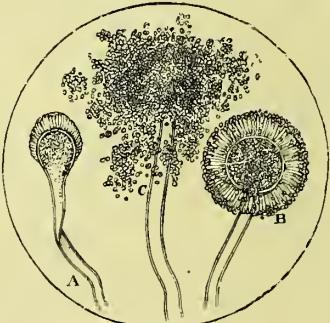


Fig. 103.

shape and size of the *receptaculum*, and the arrangement of the *sterigmata* upon it, these two parts forming the so-called ‘head’ or *sporangium*.

“ In the *A. nigricans* (fig. 103, b) the sporangia or heads are distinguished from those of the *A. glaucus* (fig. 103, a) by the fact that in the first the sterigmata cover the receptaculum, which is spherical, on all sides, while in the latter, the lower fifth or fourth of the receptaculum, which is ovoid in shape, is entirely free from sporangia.”

Dr Löwenberg described a form of aspergillus, which he observed in some

patients. In each there was an "oblong and rather flat bag, completely closed on all sides; it measured from $1\frac{1}{3}$ to $1\frac{1}{2}$ centimeter in its longest diameter (corresponding to the long axis of the meatus), and about one centimeter in one of the transverse diameters, and half a centimeter in the other. These measurements varied slightly in different cases. One of the flat faces was obliquely truncated at the end, and showed an exact east of the membrana tympani. The colour was yellowish-white in one case, light brown in the second, and whitish-grey, turning to a dirty brown, in the third. These bags were composed of mycelium, sporangia, free spores, and epidermic cellules. On examining such cases the otoscopic aspect is very puzzling, the growth entirely filling the fundus of the meatus, and hiding the membrana tympani. After removal of the bag, which is followed by great relief, the drumhead is found injected, and marked with white specks on a red ground."

These curious cystic formations were also observed by Mayer, Pacini, and others.

In the etiology of otomycosis the favourable character of the external meatus for the growth of fungi and schizomycetes has to be remembered. The partial occlusion of the canal in ordinary healthful states of it by hairs and cerumen, its shape, the temperature of its walls, the presence of moisture, at once strike us as affording in it a favourable situation for the generation and development of micro-organisms and the occurrence of fermentative changes. In the limited supply of air, in the heat and moisture, we have the most important elements of fermentation. The further tendency to otomycosis and the development of parasitical fungi, Löwenberg has shown, is increased by the nature of the substances introduced into the meatus. It is chiefly, he says, with the object of proving the possibilities of engrafting this, a very painful disease, upon the one for which the patient demands our care, that I write these remarks. In a great number of cases the affection is provoked by the introduction of an oily substance into the external ear, such as olive oil, oil of almonds, &c., at times lard, balsam, or pomade. In employing these oily substances, it is not sufficiently remembered that they all undergo rapid decomposi-

tion once they remain exposed to the atmosphere, even at an ordinary temperature; how much more so at the more elevated one of the auditory meatus. Oils contain in solution azotic substances which, under the influence of the oxygen of the air, provoke special fermentation, becoming rancid. This raises the temperature rapidly; the neutral fatty matters contained in the oil are changed into glycerine and fatty acids. Thus the spores of the musty fungi, which are abundant, are provided with all that is necessary for their germination, viz., oxygen, watery vapour (in the air), sufficient heat, organic decomposition, and the acidity which favours their development. The filaments of the mycelium grow rapidly. The acid products of the decomposition on the one hand, and the vegetable foreign body on the other, irritate the ear and set up this inflammatory process, causing the watery secretion, and exciting the formation of the organic azotic substances that are so easily assimilated by these cryptogames.¹

Also Löwenberg noticed that certain astringent solutions in common use as lotions appeared to induce this fungus growth. On investigating the cause of this, he found an explanation in the presence of cloudy collections of mycelia and spores that formed after those solutions were kept for a few days. I have examined a large number of these solutions myself, and in addition such solutions as are in common use in eye affections, and those containing the various alkaloids. I kept these solutions in corked and open bottles. I found at intervals of from one week to a fortnight in all, whether open or closed, quantities of spores, but far more in the open bottles. The carbolised and the chloride of zinc solutions were, in some of the bottles, quite free of spores; in was not so in others.

Here we have a fruitful source of fungoid and other germs of infection. More especially in catarrhal conditions of the meatus and tympanum attended by perforation of the membrane.

Bottles that have been laid by for some time, perhaps not carefully corked, are used again in cases of discharge when they may be teeming with fungus spores.

¹ See fig. 15, Plate II., drawing of oil coating on the membrana tympani.

Löwenberg advised as a preventative that the solutions thus employed should be filtered from time to time, and that they should at the same time be subjected to a few minutes' boiling; and that the bottles in which they are replaced should be carefully rinsed out with freshly-boiled water.

We see from the above how dangerous are these "oil drops" that are occasionally and aimlessly prescribed. The second danger may be obviated by prescribing concentrated aseptic solutions in absolute alcohol and recently-boiled water, and ordering the patient to make his lotion by adding a certain amount of these to the proper quantity of recently-boiled water.

Symptoms.—A patient comes to us for advice for deafness, discharge, perhaps tinnitus, with, it may be, an old perforation of the membrane, with recurrent attacks of earache and subsequent itchiness, which have lasted for some time. On examining the ear with the speculum we may find the meatus narrowed by the intermittent inflammatory attacks, and experience some difficulty in inspecting the membrane. This difficulty is further increased by a mass which blocks up the passage and obscures the view. On examining closely we see that this is not of the nature of wax. It has a lardaceous appearance, like wet paper, of a greyish-white colour; the plug is mixed with epithelium, or it appears as a round mess, and we may, on removing this with syringe or forceps, see distinctly the fungus either on the wall of the meatus, on the tympanum, in its crevices, or in the tympanic cavity if there be a perforation of the membrane. The discharge also is not of the character of ordinary catarrhal inflammation; it is thin and watery. There is with each attack of inflammation a renewal of the pain and a change in the character of the discharge. These flakes of membrane which adhere to the meatus and membrane can be peeled off, leaving an injected surface underneath, or sometimes the pellicle removed is dotted with brown spots of the aspergillus, or a perfect coat of the meatus may be detached.

Dr Burnett notes a fact that I have often observed, namely, that we seldom find cerumen and aspergillus. He points out that its occurrence has been noticed frequently where the patient had pursued

the imprudent practice of constantly picking at the ear to keep it "clean." I have frequently seen particles of wool mingled with the fungus. I have several times removed from the ear of a patient a mass of wool, the presence of which he was innocent of, when this had formed, with fatty matter, epithelium, and fungus, a complete plug in the meatus, concealing a perforation while the fungus flourished in the tympanic cavity. I have seen this disease occasionally in the better classes, but it is not a matter for surprise that I frequently met with fungus in the ear in the poverty-stricken patients in Ireland, more especially the younger ones who attend in such numbers the hospital clinique. In these, neglect of the ear, want of cleanliness, general delicacy, combined to produce it.

These facts, connected with the growth of the fungus, teach some important lessons in regard to the prophylaxis of this affection, viz., the importance of perfect cleanliness in catarrhal states of the ear attended with discharge, the avoidance of fatty and oleaginous remedies in such cases, the necessity for the daily use of antiseptic and astringent lotions where we dread the formation or development of the aspergillus.

Treatment.—In treating the fungus I place reliance principally on alcohol and glycerine—equal parts of absolute alcohol and glycerine. This I apply after thorough cleansing of the part, whether meatus or tympanic cavities, with cotton-wool on the aural probe. I also use carbolic acid and glycerine (1 part to 2) and chromic acid (grs. xx. ad $\frac{3}{4}$ i.); boracic acid with absolute alcohol and water (saturated solution). The meatus and tympanum may be washed out daily with a bichloride of mercury lotion (1 in 1000). Dr Burnett speaks highly of solution of hyposulphite of soda (grs. iij. ad $\frac{3}{4}$ i.). I make a rule to wash out the tympanum thoroughly in cases of perforation of the membrane with a disinfectant solution by passing the stream through the nose in the manner already described. Dr Laurence Turnbull speaks highly of Fowler's solution as a parasiticide, and Wreden recommends chloride of lime (gr. ij. ad $\frac{3}{4}$ i.). We must insist on seeing the patient occasionally and for some time, as by this means alone can he be certain of a permanent cure.

OTHÆMATOMA, OR SANGUINEOUS TUMOUR OF THE AURICLE.¹

Othæmatoma, or sanguineous tumour of the external ear, is, with very rare exceptions, solely met with amongst those affected with cerebro-mental disease, and has hence been termed "the insane ear."

Nature and Appearance.—Othæmatoma consists of an effusion of blood from the perichondrium investing the cartilage of the auricle, appearing as a tense and shining tumour of a reddish-

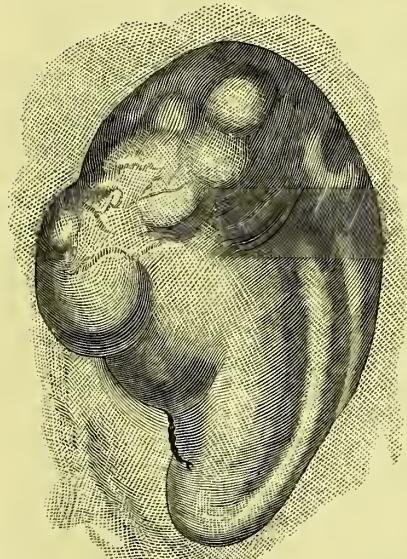


FIG. 104.—Othæmatoma in the acute or *primary* stage. Tumour of extraordinary size occupying the entire cavity of the auricle, and obliterating its ridges and hollows. Surface uneven, and in parts of a plum colour. Result, slow absorption, with extreme contraction, and finally the almost complete distortion of the auricle, and obliteration of its several component parts. Case of E. H., affected with active melancholia (taken from life).

blue or livid colour, varying in size, and occupying some portion of the concavity of the organ, rarely forming on the posterior convex surface. One such case has, however, come under my observation; here, however, the tumour was not confined to this region. When it commences in the concha, the tumour is generally localised above, and externally by the ridge of the antihelix, and extends inwards towards the meatus externus, which it may occlude, causing deafness according to the degree of

¹ I am indebted to Dr Ringrose Atkins, resident medical superintendent of the Waterford asylum, for these drawings.

occlusion. In this situation the tumour presents itself as a smooth, and usually even swelling, about as large as a pigeon's egg; when the fossa of the helix is the site of the effusion, it is confined below by the ridge of the antihelix, and the swelling then assumes a somewhat kidney-shaped outline.

In exceptional cases the tumour becomes extended over the entire surface of the auricle, and when this is the case, the various ridges and cavities become wholly obliterated, the hollow of the ear being filled by an egg-shaped swelling, fuller above, and losing itself inferiorly in the lobule, which is never implicated.

In a female suffering from active melancholia, under my charge, a hæmatoma appeared in the left ear, May 30,

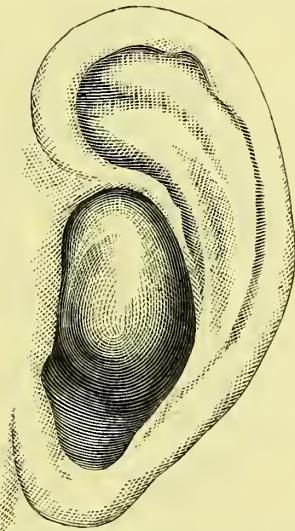


FIG. 105.—Othæmatoma in the acute or *primary* stage. Tumour of moderate size filling up the cavity of the concha; full and rounded above where it is bounded by the ridge of the antihelix, being lost below in the lobule. Result, disappearance with but little subsequent deformity. Case of C. H., affected with recurrent paroxysmal mania (taken from life).

1877, and in three days it had developed to a large globular tumour, filling the entire cavity, of a livid red colour, and completely obliterating the meatus. In two months it had commenced to shrink, and after six months the ear was quite shapeless and shrivelled. In the case of a male patient suffering from subacute mania, the entire cavity of the auricle was occupied by a large ovoid sanguineous swelling, without any known cause, in less than twenty-four hours. The ear

in this case is now also shrunken, the upper part of the concha being thrown into several sinuous folds, the organ still, however, retaining its normal shape and gross outline.

Othaëmatomata are accompanied by scarcely any subjective symptoms, but little pain or increased heat being experienced, any deafness that may exist being due to the mechanical closure of the external meatus by the tumour. They frequently form very rapidly, instances of which I have just mentioned, but usually from a fortnight to three weeks elapse before they become fully developed. The contents are usually found to be purely sanguineous, though a yellowish serous fluid has been observed to escape on puncture; the contained

quantity of sero-purulent fluid, but the tumour rapidly filled again, death taking place before further interference could be had recourse to, the case being one of far advanced paralytic dementia.

The course of othaëmatomata in many respects closely resembles that of blood extravasations occurring in other parts of the body. The tumour, in its ordinary condition, rarely bursts, though the skin may crack, and some sanguineous oozing follow, usually at about the end of three weeks, or from that to a month, when the tumour has become fully developed, the effused blood slowly coagulates, and gradually solidifies, and then what may be termed the secondary stage, or that of *shrivelling*, commences. As the watery portion of the blood is reabsorbed, and the fibrin precipitated, the skin and cartilage become irregularly adherent to the cyst walls, and the latter contract unequally upon themselves; new fibrous tissue is then formed, which in time may become cartilaginous, or even osseous; and as the result of these changes, the affected surface of the auricle is distorted, and assumes the most bizarre and fantastic forms, which are henceforth permanent.

The hollow of the ear may be thrown into irregular folds or sinuositys; the helix folded over the concha, which may be greatly thickened, and frequently the entire organ becomes so crumpled and shapeless as to be barely recognisable. I have in my possession the ears of a man who had had blood tumours very many years previously, and here the different portions of the organs have become so incorporated with each other, that their normal configuration is almost entirely obliterated.

Regarding the frequency with which either ear is affected, observers state that in three cases out of four the left is either solely, or, in cases where the effusion is bilateral, primarily attacked. In the majority of cases I have met with, the affection has been bilateral, but in those unilaterally attacked the left side has the preponderance.

Etiology and Pathology.—The occurrence of othaëmatoma was first noticed in Germany, but as an accompaniment of mental disturbance it was first studied in France by Ferrus in 1838. The result of his researches directed attention to the

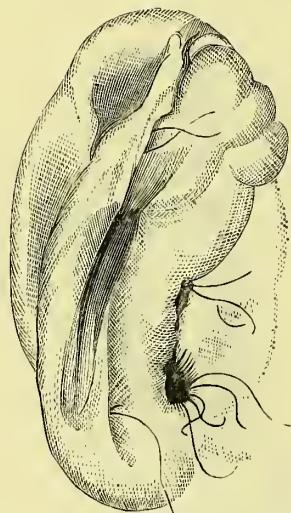


FIG. 106.—Othaëmatoma in advanced secondary stage, helix folded over antihelix, fossa of latter completely obliterated, the upper portion of the auricle was transformed into an irregularly tuberculated misshapen mass; on section a triangular portion of bone had become developed in the centre, surrounded with cartilage and connective tissue. Affection of very long standing. Case of J. M., affected with chronic dementia (taken after death).

blood remains fluid for a longer period than when extravasated elsewhere, but when evacuated shows a tendency towards normal coagulability. Suppuration sometimes occurs in the contents of the tumour, accompanied with the usual symptoms of heat, pain, &c., followed perhaps by rupture of the sac, if the latter be not surgically interfered with. In one such case lately under observation free incision afforded vent to a large

subject, and many important papers relating to it subsequently appeared from time to time, the most important being the *Memoirs of M. Achille Foville*, published in 1859, and those of MM. Delassiauve and Motet, inserted in the *Gazette Hebdomadaire* in the same year. In the year 1850, Franz Fischer directed attention to two forms of affection occurring in the ears of the insane, the one appeared as a "serous œdema," the other as a "sanguineous tumour." The first condition was frequently bilateral, colourless, and painless, rapidly forming, and as rapidly disappearing. The second was unilateral, of a special colour, painful, and of longer duration, the contents being easily reproduced after an accidental puncture, and subsequent deformity of the ear ensue. Following these authors, M. Maury published a thesis on the subject, in which he gave a *résumé* of the various views which had been advanced as to the nature and origin of the tumours up to that time.

As to the etiology of the affection, various theories have been put forward from time to time to account for their peculiar occurrence. Yung and Senbuscher attributed them to passive hyperæmia of the neck and ear, with paralysis of the vascular nerves. According to Neumann the haematoma is an erysipelas of a particular kind. Schmaltz considers the affection to be the result of inflammation of the cartilage of the ear, and Fischer coincides in this view, attributing it to a chronic inflammation of the auricular cartilage and its envelope, to which is added a dyscrasia of a particular kind. The sanguineous tumours are looked upon by Renaudin as a serous œdema, a passive haemorrhage, an active effusion, or the product of inflammatory action, according to the state of the affected individual, the nature of the malady, and the conditions which have preceded their appearance. "They are produced," says Dr Merlan, "most frequently in a spontaneous manner. Sometimes under the influence of atmospheric variations, and sometimes as the result of traumatic causes." Marcé, who has published a case of double haematoma of the ear, in which the eyelids were also the seat of sanguineous effusion, believes that, under the influence of congestion, the vessels of the ear dilate, and that this

condition determines or favours the production of hematoma.

M. Delassiauve, sharing the views of Renaudin, is of opinion that the haematoma must be in great part attributed to the textural peculiarity and special sensibility of the ear. Its proneness to become flushed under the least emotional disturbances, or under the least physical injury, and its sudden pallor under other circumstances, combine to prove, says this author, that the ear participates more than one imagines in the conditions of general life. M. Foville, in the conclusions arrived at in the Memoir already alluded to, thus expresses himself:—"The formation of sanguineous tumours of the auricle is most often preceded and accompanied by a general disturbance of the cephalic circulation." Morel is also in favour of the theory of congestion with haemorrhage. M. Ducros, in a Memoir presented to the Faculty of Medicine at Montpellier, concludes "that the causes of haematoma are multiple, but that traumaticisms alone never suffice to explain its occurrence; it appears that a local affection of the cartilage, depending on a disturbance of the nervous system, always pre-exists."

M. Castelain, who has examined the question closely, thus expresses himself:—"Under the influence of this profound disturbance of the economy, there occurs a *ramolissement* which plays a considerable part as a predisposing cause in the production of sanguineous tumours." M. Bonnet is of opinion that the sanguineous tumours of the ears are veritable congestive apoplexies due to degeneration of the sympathetic, which results in turgescence of the vessels of the ear, and, as a result, the apoplexy is produced. Griesinger leant to the hypothesis that traumatic causes were the most fruitful source of their origin, alleging that the tumours were not met with in asylums carefully looked after, and in which the attendants were active in their surveillance. In this country Dr Wilks is of the same opinion, considering the tumours to be the result of violence inflicted either by the patient himself or by others, the constitution being predisposed to sanguineous effusions. This view is, however, negatived by the experience derived from the modern treatment of the insane, which is now free from any such violence, and yet

the occurrence of haematooma is no less frequent at the present time than formerly before the humane system was introduced. Moreover, if injury were the cause, we should expect to find echymosis or abrasion of the skin with damage to the auditory apparatus, which, so far as I am aware, never appears, nor do we meet with any similar result from blows on the ear of sane persons.

Dr Nicol has suggested that the sanguineous effusion is produced by the pressure of the delicate structure of the external ear against the mastoid process of the temporal bone during sleep, by the pillow beneath—especially when the latter is hard—in a patient weakened by some “blood dyscrasia.” Were this the cause, many more cases of othæmatoma must occur, as the great majority of patients who are likely to be its subjects lie on one or the other side, bear the same pressure, and suffer from the same blood dyscrasia, and yet haematooma occurs in but a small minority. Moreover, as Dr Lennox Browne remarks (*West Riding Asylum Report*, vol. v.), “there is no reason to suppose that the pinna is delicate and peculiar in structure. Robertson considers that othæmatoma is more probably due to functional disorder of the cervical sympathetic, associated with, or perhaps resulting from, the existing cerebral or cerebro-spinal disturbance on the following data:—(1) The tumour not unfrequently appears on both ears simultaneously, without any indication of either being injured; (2) an effusion under the conjunctiva occurred in a case of dementia at the same time, and on the same side as the tumour of the ear; (3) some of its complications, such as Graves’ disease, indicate disorder of the vaso-motor system. Whether such vaso-motor disturbance is the cause or not, there can be no doubt that mental excitement, resulting from derangement of the vascular system, is a very constant factor, its occurrence being most frequent in those forms of insanity (*vide* appended Tables) in which such excitement runs high.

Pathological Appearances.—The morbid appearances presented by the shrivelled ear differ according to the age of the formation. Dr Barlow, as mentioned by Dr Alexander Robertson (*Glasgow Medical Journal*, July 1875), states that

at the end of two months he has found a section to be dark and fleshy in aspect, firm and slightly elastic in structure, and adhering closely to the cartilage of the auricle, and less firmly, though with considerable tenacity, to the perichondrium. The tumour was one-fourth of an inch in its thickest part; a transverse section, under a power of 300 diameters, showed it to be composed almost entirely of white fibrous tissue, with here and there collections of shrivelled blood corpuscles—the fibres being stained at these points with blood pigment. The fibrous tissue was denser at the point of junction of the cartilage with the tumour than at any other point. One of the shrivelled ears I last mentioned, which I have examined, measured on section 1½ inch in greatest thickness, and was dense and solid throughout. A fine section under the microscope showed it to consist of somewhat loose fibrous tissue with deposits of fine hyaline cartilage, and a little within the centre a triangular-shaped mass of bone containing wide channels with lacunæ and canaliculi. The condition of the ears here, as I have mentioned, was of very long standing, and between this and the organised clot of the earlier stages I noticed fibrous tissue and cartilage in varying degrees of development.

Forms of Mental Disorder in which Othæmatoma occurs.—Othæmatoma is not confined to any one form of insanity; it has been found in mania, melancholia, and dementia, but it occurs most frequently in general paresis, and insanity associated with epilepsy. The two following tables gives the form of mental derangement, and the relative frequency with which one or both ears were affected in fifteen cases which have come under my observation.

TABLE I.—*Males.*

One or both Ears.	Form of Mental Derangement.	Result.
Both	Acute Mania . .	Died.
Right	Subacute Mania . .	Recovered and discharged.
Both	Relapsing Mania . .	Died " at an advanced age.
Both	Chronic Dementia . .	
Right	Acute Mania . .	Recovered and discharged.
Both	Imbecile . .	In Asylum still.
Both	Acute Mania . .	Died.
Left	Subacute Mania . .	Recovered and discharged.
Left	Acute Mania . .	In Asylum still.
Both	Subacute Mania . .	" "

TABLE II.—*Females.*

One or both Ears.	Form of Mental Derangement.	Result.
Both	Acute Melancholia	Recovered and discharged.
Both	Epileptic Dementia	In Asylum still.
Left	Epileptic Idiocy	Died.
Left	Dementia	In Asylum still.
Left	Active Melancholia	" "

Dr Savage, of the Bethlem Royal Hospital, says, that in that institution he has never seen a case in which it occurred recover. I am inclined to think, however, that its importance in this respect has been too highly estimated. Referring again to the cases above tabulated, it will be seen that five out of the fifteen have been discharged recovered, and there is a prospect of the recovery of a sixth; hence, though an unfavourable prognostic, the development of a haematoma, should not, I think, be looked upon as one of the physical characteristics of a hopeless lunatic.

Treatment.—Gruber, in an article on othæmatoma in his *Handbook of Ear Diseases*, suggests surgical treatment, and recommends evacuation of the contents of the tumour and subsequent compres-

sion, the difficulty, however, of dealing with the class of patients in which such tumours occur, must in the great majority of cases prevent any such interference; it is to be feared also that such pressure as could be applied to the ear would be powerless to prevent the refilling of the tumour, the contents of which might then, from the admission of air, undergo suppuration, and greater mischief follow than if the tumour had not originally been interfered with.

In some few cases indeed, where, on other grounds, a hope of final recovery from the mental disorder exists, and when it may be important to prevent the possibility of the after deformity which will in all probability result if the swelling be allowed to run its course undisturbed, the aspiration of the sanguineous effusion may perhaps be attempted, and an endeavour be then made to induce rapid and equal adhesion between the cyst walls. Painting the surface of the tumour with vesicating fluid has been also suggested, and I believe tried successfully in several cases, though as far as I am aware it has not come into extended use.

CHAPTER X I I I.

THE NASO-PHARYNX IN RELATION TO DEAFNESS.

ACUTE NASAL CATARRH—CHRONIC NASAL CATARRH—HYPERTROPHIC STATES OF SCHNEIDERIAN MEMBRANE—CONGESTION AND HYPERTROPHY OF THE TURBINATED BONES—TUMOURS OF THE TURBINATED BONES—STENOSIS OF THE NASAL FOSSA—DEVIATIONS OF THE SEPTUM NASI—GROWTHS OF THE SEPTUM—OPERATIVE PROCEDURES—SCARIFICATION—GALVANO-CAUTERY—SNARE AND GALVANIC LOOP—REMOVAL OF POLYPUS—SHEARS, GOUGE AND SAW—RULES FOR OPERATING.

THOSE affections of the naso-pharynx which most concern the surgeon are:—

Acute nasal catarrh.

Chronic nasal catarrh.

Hypertrophic states of Schneiderian membrane.

Congestion and hypertrophy of the turbinated bones.

Tumour of the turbinated bones.

Stenosis of the nasal fossa from any cause.

Deviation of and growth from the septum nasi.

Follicular pharyngitis.

Post-nasal catarrh.

Adenoid growths of the naso-pharynx.

Hypertrophy of the tonsils.

ACUTE NASAL CATARRH.

Causation.—Amongst the principal causes may be placed—exposure to cold, sudden vicissitudes of temperature, season of the year, the nervous and rheumatic temperaments, cold extremities, change of clothing, bodily fatigue.

Symptoms.—During the first stage there are slight rigors, general malaise, fits of sneezing, watery discharge, containing lymph corpuscles and epithelium cells from nostrils, sense of fulness in the head, slight frontal ache, irritation of anterior nares from the constant discharge. The eyes participate in the general coryzal state, the lids are swollen and red, and there is an increased secretion of tears. During the second stage those symptoms gradually subside, the nose becomes stopped by accumulation of muco-purulent or purulent secretion, the Schneiderian membrane is swollen. In the third stage the swelling and discharge slowly disappear, and the patient gradually regains health. At various times during the progress of the cold there may be a feeling of fulness in the ear, slight singing tinnitus, and partial deafness. These auditory symptoms are more marked in those who are subject to Eustachian deafness and catarrhal states of the middle ear. Sometimes the uvula and soft palate are involved in the general catarrh, the follicles become enlarged and the uvula is swollen. Smell and taste may be temporarily affected.

Treatment.—To arrest a “cold in the head” is not an easy matter. It is rather in the prevention of acute catarrh, by laying down rules for clothing, exercise, and diet, that the surgeon can do service than in its cure (see chapter on Hygiene). The following are some of the more simple means of arresting and treating a cold; the administration at night of the powder:—R Nitratis potassæ grs. x., P. Jacobi Ver grs. iii., Pulv. Doveri, grs. ii.-iv., the powder to be taken at bed-time after a hot foot-bath, followed by a warm drink immediately on or before going into bed (whey or gruel). The patient, if the cold is threatening, and during the first stage, will find the inhalation of camphor a most soothing remedy. This may either be done with the naso-oral inhaler of the late Dr Spencer Thompson, the powdered camphor being added to the hot water or (what I find equally efficacious) the camphor is heated over the fire and some of the warm oil rubbed in the hands, which are held so as to make a tight naso-oral cup, while the vapour of the camphor is drawn in through the nose and mouth. A cone of stiff brown paper can be so narrowed

to cover tightly the nose and mouth, the narrow end being fitted to a small circular-topped jug, and thus the steam of the hot camphor water may be inhaled. A dessert-spoonful of the following mixture taken in a little water three or four times in the day has an admirable effect on a cold:—Ry. Spt. Qth. nitrosi 3iii., liq. am. acet. 3iii., liq. antimonialis, 3ii. Tr. op. 3i, syrapi simp 3iii. (For Dobell's Snuff see Formulae.) A Turkish bath will frequently prevent and cure a cold.

Ferrier's snuff is still used, but I cannot say that I have seen any great benefit from it. Now and then it lessens the severity of the flux and the symptoms of rhinitis. It contains morphia hydrochloratis grs. ii., pulv. acaciae 3ii., bismuthi trisnit 3vi. A mixture of bromide of potassium and tincture of belladonna is also of considerable service in acute catarrh.

CHRONIC NASAL CATARRH.

Causation.—Recurrent acute attacks, nasal and post-nasal growths (see adenoid tumours), temperament, syphilis, polypus.

Symptoms.—The most marked feature is a constant persistent and obstinate discharge (rhinorrhœa) of varying consistency. Accompanying this is generally a sense of stuffiness in the nose, and chronic redness and swelling of the Schneiderian membrane, which leads to nasal obstruction and nasal speech. Occasionally the discharge is muco-purulent, and there are sore spots and patches of eroded mucous membrane on the cartilaginous septum.

Treatment.—We may often exhaust every conceivable astringent and alkaline powder and spray in these cases without any apparent benefit. In some persons the discharge rather increases with almost any local treatment.

Bismuth, tannic acid, alum, salicylic acid, singly or in combination, can be tried. Bougies of iodol, bismuth, acetate of lead, and a variety of solutions, as sprays or douches, such as common salt, bicarbonate of soda, chlorate of potash, chlorinated soda, either by means of the hand sprays, nasal irrigator, or syphon douche. In severe cases resisting ordinary means, the application of Löwenberg's galvano-cautery knife will be

found of great service, and is generally followed by a decrease in the discharge and permanent reduction of the swelling (see chapter on Löwenberg's Galvano-Cautery).

Cocaine spray I have used with marked benefit (4 to 10 per cent.) in congested and catarrhal states of the mucous membrane and in chronic hypertrophic conditions of the pituitary bones. I cannot but think that in those cases in which cocaine has been reported to have produced, through the use of a weak (2 to 4 per cent.) solution dropped into the eyes, symptoms of alarming syncope, this effect must have been due rather to the pain or shock of the foreign body or interference than to

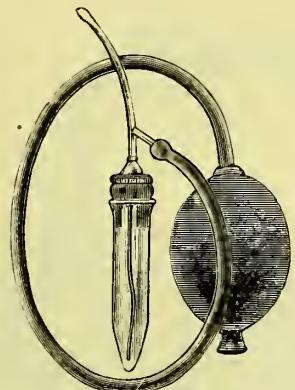


FIG. 107.—Cocaine Spray for Nose or Ear
(Allen & Hanbury).

the cocaine. However, this occurrence, noted by several surgeons who have used it, is not to be overlooked. Cocaine wonderfully facilitates operations on, and explorations of, the nares. The galvano-cautery, however, when applied only to the diseased part, is not so painful as may be imagined, judging from the statements of patients who have used it without cocaine or an anaesthetic.

The practitioner in any case in which obstruction in the nasal fossa, visible anteriorly, is a complication of deafness, may be guided in his conclusion as to the nature of the obstruction, by remembering these clinical facts.

Polypus-nasus does not grow from septum, is generally found in the middle meatus, is pedunculated, is globular and smooth, is single or multiple; it is painless, can be isolated by the probe, and is soft; it has a distinct history of growth with

characteristic symptoms. It seldom affects audition.

Simple Neoplastic Hypertrophy of the Turbinated Bones.—There is a general increase of redness of the pituitary membrane, which appears swollen and injected. The globular or curved surface of the turbinated bone appears to be part of the septum, at times touching it; the soft protrusion can be compressed with the probe on to the osseous structure, and its continuity with the bone easily ascertained. There often is attendant enlargement of the bone accompanying this hypertrophy. There is a history of recurrent catarrh, and possibly permanent chronic catarrh. Audition is occasionally affected.

Exostoses.—These tumours more frequently proceed from the inferior turbinated bone; they are generally associated with other congestive or hypertrophic states of the mucous membrane, the probe at once strikes on a hard resistant surface directly continuous with the outer wall of the fossa; they impede the insertion of the speculum, and can often be readily felt with the finger; they prevent nasal respiration, and affect pronunciation. Audition is commonly affected.

Enchondromata spring from the septum anteriorly, are seen quite close to the aperture of the nostril or occluding it, sometimes push the ala aside, are comparatively soft, can be distinctly seen as part of the septum and traced continuous with it; there is a concavity at one side of the septum corresponding to the convexity at the other; they cause nasal deformity and obstruct nasal respiration. Rarely affect audition.

Deviation of the Septum.—This cause of obstruction is frequently associated with other abnormal conditions of the nose, as deformity and lateral displacement the result of injury, tumours growing from the turbinated bones, enchondroma of the septum itself. There should be no difficulty in diagnosing displacement in any part of the septum by means of the aural probe and rhinoscopy. Sometimes affects audition.

Other Tumours and Morbid States.—Other diseased states of the nasal fossa, such for example as necrosis, syphilitic ulceration, malignant growths have clinical features so characteristic, apart from the fact that they do not generally

affect the hearing, that we need not here consider them.

Operative Treatment.—I have sufficiently dwelt on the general therapeutical treatment of catarrh and simple hypertrophic states of the mucous membrane to limit any remaining remarks to the necessary operative measures to be adopted in those cases in which the nasal obstruction is of such a degree as to demand and justify them.

Abnormal Conditions of the Turbinated Bones and Septum Nasi.—Operative procedures of a more severe nature are called for in cases of deafness in which we find permanent nasal obstruction coincident with the aural affection. It may be impossible to pass the Eustachian catheter. The ventilation of the middle ear may be completely interrupted through hypertrophic conditions and neoplastic growths. Erectile tumours, or polypi growing from the lower turbinated bones, or the obstruction, though more rarely, may occur from the septum in the shape of deviation, enchondromatous or fibrous tumours, or exostosis.

Diagnosis.—In the diagnosis of these sources of obstruction we must be careful not to mistake such hypertrophic conditions or other enlargements of the turbinated bones for polypus. With careful examination of the nasal fossa by a good light and the nasal probe, no one on his guard against such an error is likely to fall into it. Thorough acquaintance with the natural appearance of the nasal fossa, not from the ideas conveyed by plates and diagrammatic representations, but from close inspection with the nasal speculum, both by sunlight and artificial light, and this not by the eye alone but by the assistance of the nasal probe.

Such inspection is an important step not to be overlooked in any aural case, and by making it the rule of practice to examine thoroughly the nose, we soon familiarise ourselves with the normal look and position of the parts, and in the anterior nasal fossa, by sight and touch. We thus come readily to detect any abnormality in colour, size, or position of the turbinated bodies or septum—the degree and site of the stenosis. When we reflect that not unfrequently simple enlargements of these structures, or even congenital departures from their natural form or position, have been mistaken for

disease, and that attempts have in consequence been made to remove them, we recognise the importance of familiarity with their natural appearances and the

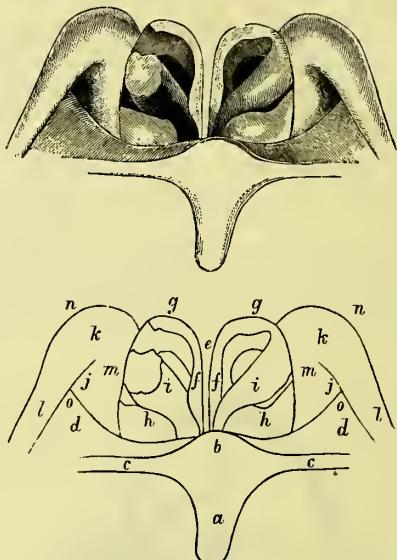


FIG. 108.—Posterior Rhinoscopic View, as seen with the mirror in the ordinary position and without the use of any instrument to draw forward the palate. The posterior nares and Eustachian openings were carefully sketched under illumination with electric light, from a male adult in whom there was paresis of the soft palate. The Eustachian cushions and folds have been semi-diagrammatically drawn as they were not very closely marked, but the upper margins of these cushions appeared distinctly above the level of the summits of the choanae. Drawn by the Author: ¹ a, posterior surface of uvula; b, uvula cushion; c, c, posterior margin of palate (across palatopharyngeal); d,d, levator cushions; e, septum nasi; f,f, swellings on the sides of septum; g,g, choanae or posterior nares; h,h, inferior turbinated bodies; i,i, middle turbinated bodies; j,j, Eustachian openings, more strictly the depressions leading to them; k,k, Eustachian cushions; l,l, salpingo-pharyngeal folds; m,m, salpingo-palatine folds; n,n, position of upper part of Rosenmüller's fossa; o,o, posterior tubal sulci.¹

commoner departures from these (see Examination of Nose, chap. vii.).

Having a clear idea of what the normal condition of the parts is, we can readily recognise the extent and character of any obstruction, and judge how far operative interference is warranted or otherwise.

We are not likely to mistake the globular look and pedunculated attachment of polypus, whether single or multiple. The probe will generally decide the question both by the detection of the mode of attachment and the softer feel of the polypus. It is not so much even in

¹ I am indebted to Mr Cresswell Baber for this drawing and description taken from his work on the *Examination of the Nose*.

the diagnosis of polypus from other growths, as for example certain vegetations and neoplasms, that we must be careful not to fall into error, as in the ease with which we satisfy ourselves that the supposed tumours are not mere hypertrophic enlargements, or some abnormal positions of the turbinated bones or septum.

OPERATIVE MEASURES.

Scarification.—The swelling that results from acute congestion of the pituitary membrane if excessive, and that it does not yield to douches or irrigation, may be relieved by scarification. The

turbinated bones. The blade is plunged a few times into the thickened tissue, care being taken to avoid the septum. The galvanic loop may also be employed for the removal of soft exostosis and some enchondromatus growths.

THE SNARE AND GALVANIC LOOP.

These are useful in the removal of polypus. The semi-barbarous practice, in the light of our modern appliances, should be avoided of simply tearing away polypoid growths with the nasal polypus forceps, and then abandoning the patient to his fate, until a re-growth necessitates a renewal of the process.

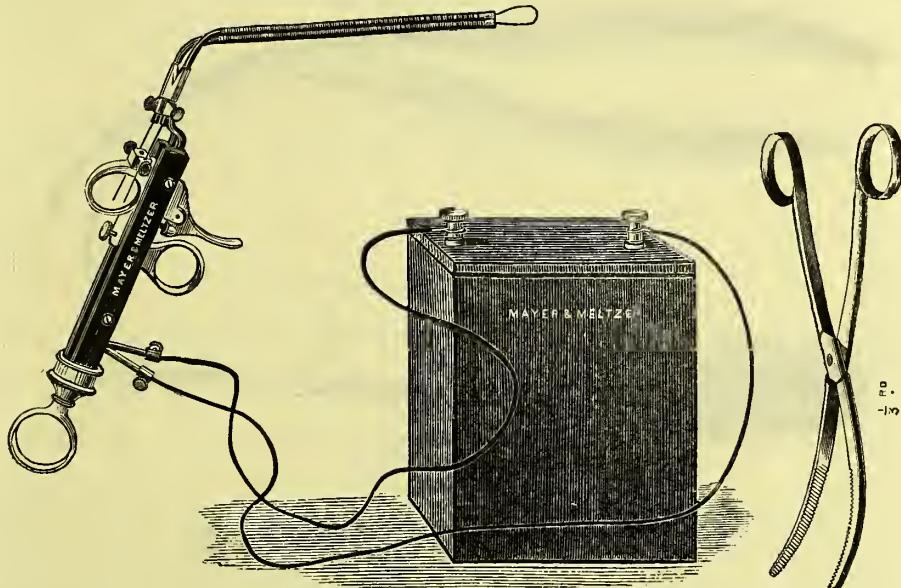


FIG. 109.—The Snare and Galvanic Loop.

FIG. 110.—Nasal Polypus Forceps.

swelling is well exposed by the speculum of Duplay, or two small nasal retractors, and a few linear incisions are made into it. The bleeding, which should be first encouraged by hot fomentation, can be restrained if excessive by a nasal plug.

GALVANO-CAUTERY.

Löwenberg's instrument and the galvano-cautery have already been described (pp. 75, 76). With any of its loop blades we can reduce the more permanent hypertrophic conditions of the

If the snare or nasal ecraseurs is used, or the cutting instrument (polypus guillotine) of Mr Marshal, the attachment of growth having been well ascertained, and the polypus thoroughly exposed with a good light, the thin steel or piano wire is carried well down to its attachment. A miniature wire prong, similar to that used for carrying the wire to the neck of a uterine polypus, will assist in effecting this step. When the polypus is removed the site must be touched with the galvano-cautery.

Failing this, the best solution will be

found to be either perechloride of iron or chromic acid (grs. xxx., ad 3*i.*). These may be applied the day after removal on the ordinary Playfair's uterine probe—all danger of touching the healthy membrane being avoided by the use of a cannula. This dressing should be repeated from time to time. Bismuth (oxychloride) powder may be insufflated nightly by the patient.

The ethylate of soda, as recommended by Dr B. W. Richardson, the healthy membrane being carefully protected, can be tried on any small re-growths, or they can be attacked with the galvano-cautery. If the galvano-cautery be at hand it is the cleanest and best method

"nasal plough" of Woakes will be found the best), and a director or guide. [Woakes uses a catch forceps, which acts both as guide and forceps. The bone is grasped by the blades of the forceps at the line of section; the catch secures the blades firmly, which serve as a guide for the plough or gouge.]

A fine nasal saw, as recommended by Woakes, when it can be used, affords the best means of removing osseous growths from the turbinated bone. In using any of these instruments for the removal of morbid growths or unhealthy osseous structures from the nasal fossa, in cases of deafness, we may accept the following rules for our guidance:—

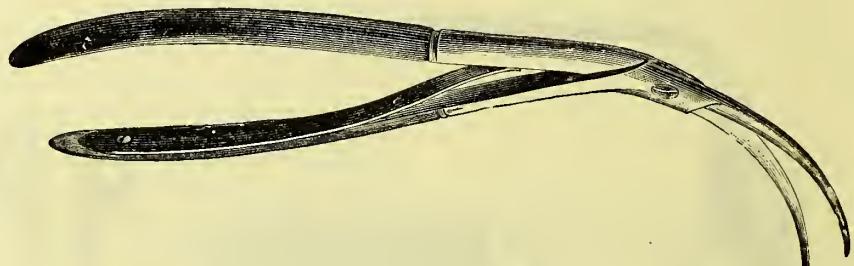


FIG. 111.—Shears for Operating on Nasal Growths.



FIG. 112.—Nasal Plough.



FIG. 113.—Nasal Saw (Woakes).

of removing polypi. [Jarvis's snare for the removal of nasal polypus is by far the most perfect, and is the one I recommend to those who do not mind a more expensive instrument.]

The severer operation for the removal of larger nasal polypi and the ethmoid bone, are not here considered.

SHEARS, GOUGE, AND SAW.

In operating on growths from the turbinated bone, osseous or other, we require a strong curved, blunt-pointed scissors, or rather shears (Woakes), with a spring separating the handles; a gouge (the

1. Never to resort to any operative interference unless fully satisfied that the degree of obstruction and the nature of the growth demand such.

2. Before operating be clear as to (*a*) the nature of the growth, (*b*) its position and size, (*c*) the quantity of healthy structure that may have to be sacrificed and the line of section. After none of these operations, if carefully performed, need we fear haemorrhage of a dangerous nature.

DEVIATION OF THE SEPTUM.

I have at the present time a lady under treatment for whom I rectified a

lateral displacement of the nose, causing considerable deformity, which was present from childhood. I used, as I generally do, a strong rough-headed forceps, curved to avoid the soft parts, with the bladder well protected by chamois, subsequently making her wear

table, of Welbeck Street, the septum bulged to the left side to that extent that it protruded the corresponding nostril and caused considerable deformity. The patient, a child of eight, had the septum forcibly straightened under ether, and a septum clamp applied

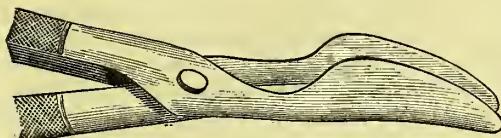


FIG. 114.—Adams's Septum Forceps.

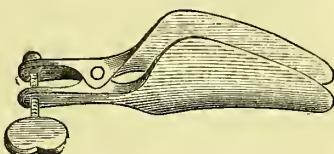


FIG. 115.—Adams's Septum Clamp.

an Adams's septum splint. I have several times operated in this manner, forcibly straightening the septum and immediately introducing the splint.

OPERATIVE PROCEDURES.

In another case quite recently under my care, introduced to me by Dr Bas-

which he wore for some time to keep it in position. The case has done remarkably well, there being no appreciable deformity remaining.

If there be complete stenosis from displacement of the septum, it may be necessary to punch an aperture in the septum, from the side of the open nasal passage, but this is rarely necessary.

CHAPTER XIV.

AFFECTIONS OF THE NASO-PHARYNX—*continued.*

HYPERTROPHY OF THE TONSILS—POST-NASAL CATARRH—ADENOID GROWTHS OF THE NASO-PHARYNX.

HYPERTROPHY of the tonsils is mainly a disease of early life, being sometimes congenital, and in the great majority of cases becoming developed at or before the age of puberty. Statistics show a considerable preponderance as regards the male sex. [I cannot say that this is my experience. I have seen enlarged tonsils quite as often if not oftener in females.] The condition is occasionally a result of previous quinsy, or one of the acute exanthems, where the throat has been severely involved. It may be due to syphilis. Certain local affections, such as granular pharynx and nasal polypus, appear sometimes to assist in giving rise to it, probably from irritation. Chronic enlargement of the tonsils, however, is frequently one of the local manifestations of a strumous taint. Towards middle life the volume of the glands steadily decreases, so that it is

extremely rare to meet with a case of this affection in a patient over forty years of age.

Both tonsils are usually enlarged, though not to an equal degree. They are often of the size of a chestnut, and sometimes much larger, meeting each other in the middle line, and quite concealing the back wall of the pharynx. This hypertrophy can in many cases be guessed from the mere aspect of the child, as “with its open mouth, drooping eyelids, dull expression, and thick voice, it enters the consulting-room.” [This description, however, applies much more to the child suffering from adenoid growths in the nasopharynx.]

By the projection of the enlarged tonsils into the passage of the fauces, they hinder the respiratory process, and

this is usually accompanied by difficulty in swallowing. Snoring during sleep is a characteristic sign in young children, and a sensation as of a foreign body constantly provoking the act of swallowing is often complained of. The voice is muffled, and has a thick, somewhat nasal twang, whilst the articulation is very indistinct.

Defective hearing, or even deafness, is often associated with enlarged tonsils, probably from irritative congestion, and chronic thickening of the mucous membrane lining the Eustachian tube. The chief cause, however, of interference with the hearing, is supposed to be due to pressure on the posterior lip of the Eustachian aperture by coincident hypertrophy of the so-called "pharyngeal tonsil" (see chapter on Adenoid Growths for the differentiation of hypertrophy of the tonsils from adenoid enlargement).

What renders hypertrophy of the tonsils a serious disease, is the constant mechanical interference with healthy respiration, and the consequent lowering of the vitality of the whole organism from imperfect oxygenation of the blood. Not only is the passage of air into the larynx from the posterior nares arrested by the diseased masses in many cases, but there is often some difficulty in breathing through the mouth, which has to be kept open. The other physiognomic peculiarities already mentioned are no doubt attributable to the persistent lack of due arterialisation of the brain and vital system generally.

Chronic hypertrophy of the tonsils renders the sufferers peculiarly liable to delicacies of different kinds, especially to diseases of the air-passages; and, at the same time, the feeble vitality of such patients makes them unable to resist any strain on the system. Mal-nutrition, moreover, may follow as a direct consequence of the difficulty of swallowing, caused by the enlarged glands. Derangements of the senses of taste and smell are frequently found in connection with long-standing enlargement of the tonsils.

Pathology.—Pathologically considered, the condition is that of hyperplasia, affecting all the constituent elements of the tonsil. There is usually thickening and hardening of the areolar stroma of the gland, the follicles are enlarged, and the lacunæ are dilated, and filled with

thick curdy mucus, sometimes even with chalky nodules. There is also thickening of the capsule, and occasionally the neighbouring lymphatic glands are enlarged. In some cases the tonsils present but little enlargement, but their surface is rough, and, as it were, *honey-combed*, owing to the enlargement of the lacunæ. Tonsils in this condition are exceedingly liable to inflammation.

Diagnosis.—The recognition of enlarged tonsils generally presents no difficulty; but still it is necessary to be on one's guard against possible error. The glands may appear to be very much hypertrophied through being rotated forwards and towards the middle line, so as to present their inner surfaces anteriorly and appear near to each other, thus simulating great enlargement. To avoid error from this source it is well, in examining a patient's tonsils, to make him open his mouth widely, and take a deep breath, when the natural relations of the parts will be retained. On the other hand, tonsils which are in reality much enlarged may escape observation from being almost hidden behind the anterior pillars of the glands. A correct estimate of the volume of the organ can be obtained by palpation, the first finger of one hand being applied to the internal surface of the tonsil, and that of the other to the outside of the throat close behind the angle of the jaw.

Treatment.—Hypertrophy of the tonsils in children usually demands immediate treatment, the cases being very exceptional which tend to spontaneous cure, and the constitutional effects of the condition being usually, as already stated, of so grave a nature. An enlargement beginning in adult life is seldom anything more than a local inconvenience. It may, however, be more serious in a patient naturally delicate, especially if the gland be often attacked by acute inflammation.

The treatment of tonsillar hypertrophy may be divided into *local*, *constitutional*, and *operative*.

Local treatment, which consists in applying astringent remedies directly to the enlarged gland, is seldom of much efficacy in reducing its bulk, but such agents have a very beneficial effect upon the *honeycomb* tonsil. A solution of perchloride of iron (3*i.* ad 3*i.*) may be applied once or twice daily with

a brush, or finely powdered alum or tannin may be blown into the tonsil with an insufflator, and then rubbed well into the surface of the tonsil. Tincture of iodine painted over the enlarged structure has little or no effect, nor does solid nitrate of silver answer better, though both are often recommended.

I have found the greatest benefit from insufflation on the tonsils of guaiacum (see formulæ), combined with the local application of perchloride of iron in solution. The tincture of guaiacum in those cases arising out of quinsy is of decided service administered internally.

In real hypertrophy of the part, escharotics sometimes give good results. The London paste (Throat Hospital Pharmacopœia) is efficient in diminishing the size of enlarged tonsils as to

treatment in all cases in which it is permitted is amputation of the enlarged position of tonsil. Any other method is apt to end in failure, and has no advantage over operation, and involves a long continued course of troublesome and unnecessary treatment.

With any of these local measures should be combined constitutional treatment according to the particular indications of each case. For this purpose, fresh air, nutritious diet, with general tonics, or special remedies, such as iodide of potassium, cod-liver oil, and phosphate of iron, should be employed. The sulphurous springs of Bagnères de Luchon are said to be very beneficial in such cases.

Operative treatment consists in the amputation of a portion of the hypertrophied means of the tonsillotome.

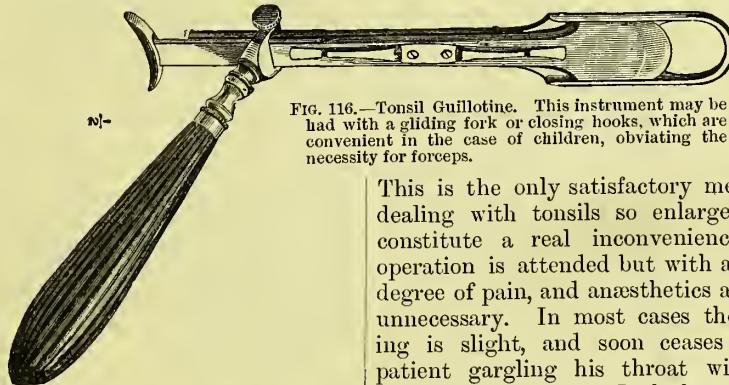


FIG. 116.—Tonsil Guillotine. This instrument may be had with a gliding fork or closing hooks, which are convenient in the case of children, obviating the necessity for forceps.

preclude the necessity for a cutting operation. The powder should be mixed with a little water, and rubbed up to the consistence of thick cream, and applied to separate points of the diseased structure by means of the pharyngeal spatula. Immediately after the application, the patient should freely gargle his throat with cold water. This should be repeated at intervals of two or three days, and care should be taken not to apply the paste too freely. Its effects should be closely watched, lest extensive inflammation be set up by its use. Injections of dilute acetic acid (B. P.) into the parenchyma of the tonsil by means of a curved syringe is occasionally successful, but the process is painful. Tonsillar hypertrophy has also been reduced by electrolysis.

It will be found that the best plan of

This is the only satisfactory method of dealing with tonsils so enlarged as to constitute a real inconvenience. The operation is attended but with a trifling degree of pain, and anaesthetics are quite unnecessary. In most cases the bleeding is slight, and soon ceases on the patient gargling his throat with cold water or sucking ice. If the haemorrhage be severe, the patient should be directed to swallow slowly a small quantity of tannin held in suspension in water. The tannin is not intended to be dissolved, and a little gallic acid added to the water prevents solution taking place. The following formula will be found almost invariably successful:—

Tannic acid,	360 grains.
Gallic acid,	120 grains.
Water,	1 ounce.
Rub the acids to a fine powder and mix with the water.	

Half a teaspoonful of the fluid very slowly swallowed is generally sufficient, and no more than is necessary should be administered. The patient, however, should be instructed to have some of the medicament by him, so that he can at once use it in case the bleeding recurs.

The wound usually heals spontaneously

in a week or ten days. The patient should be enjoined to remain indoors for a few days, and to avoid hot or irritating articles of diet. If, as sometimes happens, especially when the bleeding has been severe, the wound becomes covered with an unhealthy exudation, two or three light applications of solid nitrate of silver will suffice to change the ulcer to a healthy granulating surface.

During all the years I have been operating on the tonsils I have never known any unpleasant result either through haemorrhage or otherwise follow amputation.

On the contrary, anaesthetics decidedly complicate the removal, and often render one of the simplest operative steps in surgery tedious and troublesome. It can only be in the instance of highly nervous and timid persons or restless children that anaesthetics are indicated. Even from nervous children by a little tact, and preventing them seeing any instrument, or by the use of the tonsil scissors, the tonsils can generally be removed without any anaesthetic.

Post-Nasal Catarrh.—This affection occurs in two forms, the one moist, the other dry. The former occasions but little inconvenience. The mucous membrane of the posterior wall and vault of the pharynx is slightly swollen, and more or less covered with thick tenacious mucus of grey or yellow colour, if not blackened by city air. The patient is troubled by a constant pouring down his throat. The affection often passes away spontaneously, but sometimes proves rather obstinate, getting better or worse from time to time, almost disappearing in warm dry weather, and again becoming troublesome in wet or cold weather. In such cases, a stimulating application of chloride of zinc (gr. xx. ad. 3*i.*), perchloride of iron (3*i.* ad. 3*ij.*), or nitrate of silver (gr. x. ad. 3*i.*) will prove beneficial. Stimulating inhalations of pine or juniper [eucalyptol or turpinol] inspired through the nose also greatly assist in effecting a rapid cure. [The author's eucalyptus cigarettes or those of iodoform and eucalyptus (Corbyn) and cigarettes of cubes, will be found useful in both this and the dry type of the disease.] [See also Chronic Nasal Catarrh.]

The dry form of post-nasal catarrh gives rise to much more disagreeable

symptoms, and more frequently occasions deafness. On examining the throat, the back wall and vault of the pharynx, and more rarely the superior turbinate bones, are seen to be dry and shining, or covered with a thin yellowish-brown adherent crust of mucus. When the membrane is merely dry, it is of a bright red colour, and in those cases in which there is an adherent secretion, the mucous membrane will be seen to be red if the discharge be removed. The mucous membrane for some distance round is generally much inflamed, and its veins and capillaries are in a turgid condition.

Sometimes, owing to the secretion undergoing certain putrefactive changes, a peculiarly disagreeable odour is exhaled by the patient. This, in fact, constitutes the commonest form of ozæna. The complaint has sometimes been described as atrophic catarrh, but the disease may go on for many years without the slightest loss of substance taking place.

Treatment.—For the cure of this form of the disease, it is of the utmost importance that the adherent secretion should be entirely removed. This can be most effectually done by spraying the part with an alkaline solution, to which a small quantity of carbolic acid has been added. The following formula will be found serviceable:—

R Acid Carbol.	.	.	.	m	xx.
Zoda Carb.	.	.	.	ʒ	ij.
Ag. ad.	.	.	.	ʒ	viii.

After the crusts have been got rid of, the parts should be freely swabbed with a solution of nitrate of silver. The patient should be taught to apply it himself. [After the nitrate of silver solution is applied the patient should lie on the back and gargle with a warm solution of common salt; this neutralises the unpleasant effects of the nitrate of silver.] If after a fair period of time no benefit results from this treatment, perchloride of iron (3*i.* ad. 3*ij.*), or chloride of zinc (grs. xx.-xl. ad. 3*i.*) should be substituted as a local application. If the catarrh extend low in the pharynx, the effervescing chlorate of potash and the compound eucalyptus lozenges or pastilles often give great relief, and assist in effecting a cure. Great advantage is also derived in many cases from injecting an alkaline wash through the patient's

nostrils, or directing him to suck it up through his nose.

In these cases of post-nasal catarrh, the naso-pharyngeal douche, or the curved douche for use through the mouth will be found most efficacious. I am in the habit of using mild chlorinated soda washes, combined with salicylic acid and sulpho-carbolate of zinc. Permanganate of potash is the most useful as a douche for disguising odour, or the cigarettes before referred to may be smoked for the same purpose. I find great benefit from the thorough swabbing of the naso-pharyngeal cavity with carbolic acid and glycerine, and chloride of zinc or perchloride of iron applications as recommended by Dr Mackenzie. This can be well done with the uterine probe of Playfair, or any nasal cotton-wool holder. The forceps of Turnbull (Fig. 62) may be used through the nose to swab the naso-pharynx, or a laryngeal brush wet with the solution and curved for the purpose may be passed behind the soft palate through the mouth. These patients must be all taught to use the nasal douche. I have found great service follow from wearing nightly a plug of wool in the nostril smeared over with vaseline and iodoform (15 grs. ad. 3*i.*), or the iodoform deodorised or iodol are diluted with bismuth and starch and are blown with an insufflator on the pharynx. The patient should also be taught to use antiseptic and deodorant gargles while lying on his back, so as to thoroughly reach the seat of the affection.

In treating all such cases it should never be forgotten that constitutional treatment must accompany the local applications, as for instance, attention to diet, exercise, change of air, the ventilation of sleeping apartments. Frequently in syphilitic cases a course of the bi-chloride of mercury with preparations of bark, or the bicyanide of mercury (gr. $\frac{1}{2}$) with quinine (gr. ij.), and arsenious acid (gr. $\frac{1}{40}$), will be of service. This should be alternated with a course of iodide of potassium and bark. So in anaemic cases much may be effected by the combination of iron and arsenic (see formula). With children, cod-liver oil and iron, the syrups of the hypophosphites, and preparations of lime, will be found useful.

ADENOID GROWTHS IN THE NASO-PHARYNX; INFLUENCE ON HEARING.

We frequently meet with adenoid tumours in childhood and youth, causing a train of symptoms which soon attracts the attention of the parents.¹

The large bed of adenoid tissue extending from the fossa of Rosenmüller and the Eustachian tube at either side forming the pharyngeal tonsil, a kind of (Lacauchie) "secreting sponge," is the frequent seat of these adenoid collections. They are "covered with epithelium, of which the superficial cellules are cylindrical and generally vibratile; the substance is composed of adenoid tissue, of which the trabccules only become visible after we have removed with the forceps the numerons lymphatic cellules which fill the network."

Löwenberg believes that the difference between adenoid growths and the granulations so frequently met with in the pharynx lower down than the level of the soft palate consists in this, that the former involve the entire group of elements of the mucous membrane of the naso-pharynx, whereas it is simply the follicles that are hypertrophied in the latter (follicular pharyngitis). There is a strict histological similarity, however, between the two, the difference depending rather on the anatomical site of the adenoid formations.

Etiology.—In the etiology of adenoid growths, it would appear that heredity plays an important part, an entire family being at times affected, and the characteristic symptoms, with the accompanying physical characteristics, being found in the parents. As we might expect from the presence of growths that obstruct the nasal cavities and the Eustachian tubes, the symptoms are due to the interference with the functions both of respiration and hearing. Naso-pharyngeal catarrh, nasal speech, inter-

¹ In his brochure on adenoid tumours, Dr Löwenberg, who first proved (1865) the direct relation of adenoid tumours of the naso-pharynx to the well-known granulations on the posterior wall of the throat (follicular pharyngitis—Virchow), fully enters into the etiology and symptomatology of this affection (*Medical Press and Circular*, April to June 1879, Dr Löwenberg on "Adenoid Tumours of the Naso-Pharynx, their influence on Hearing, Respiration, and Phonation," translation by the Author).

ference with nasal respiration, breathing with the mouth open, snoring at night and restlessness, alteration in the form of the chest-wall and peculiar physiognomy, and perhaps gait, are the characteristic symptoms. The occlusion of the nasal cavities, and consequent interruption with their function, produces in time serious changes in the pituitary membrane, which becomes thickened or dropsical (Störk), the sense of smell is blunted or obliterated, and to a degree that of taste; the nose ceases to act as our natural respirator and air filterer, the air reaches the lung more directly impregnated with impure matters, and colder.

A characteristic deformity of the chest has been observed in connection with enlarged pharyngeal and adenoid tumour tonsil, consisting in a circular depression of its walls at the junction of the lower and middle thirds, with an appearance of abnormal bulging at the upper part of the thorax. Löwenberg thus accounts for the peculiar prominence of the *çondrosternal* cartilages. "A time must of necessity arise when the obstruction of the posterior nares, which is habitually incomplete, becomes still more impeded during certain attacks of greater swelling, or of more copious secretion, which are peculiar to the affection. At those times nasal respiration is insufficient, but, as the patient has not yet exclusively breathed by the mouth, from time to time he involuntarily closes it, and attempts to breathe by the nose, this latter being closed, the thoracic cavity cannot be enlarged. In consequence of this there is lowering of the diaphragm and contraction of the intercostal muscles, particularly the external, which tend to enlarge the thorax during the air passage through the glottis; for the same reason there is also flattening of it. This flattening proceeds from the predominance of the atmospheric pressure on the one hand, and on the other the elasticity of the pulmonary tissue, which tends to diminish the volume of the lung in proportion as the intrapulmonary pressure diminishes." Thus the intercostal spaces are deepened and the cartilages are deformed.

To the peculiar defect in speech Löwenberg applies the French term "*nasonnement*."

The letters *m* and *n* are converted respectively into *b* and *d*. There is in addition an absence of resonance in the vocal sounds. This is the direct consequence of nasal obstruction at the *posterior* nasal apertures. It is especially perceptible in the pronunciation of the German nasal sounds. This is not to be confounded with "nasal twang," or the sound conveyed when a person speaks too much through the nose—nasal speech increased,—on the contrary, "*nasonnement*" expresses speech in which there is no nasal resonance.

Now that we are so familiar with the effects of adenoid enlargement on the hearing, it is not necessary to dwell here for any length on the influence the adenoid



FIG. 117.—Appearance of Patient suffering from Adenoid Growths in the Naso-Pharynx; from a Photograph (Cresswell Baber).

encroachment must exert, through swollen or closed Eustachian tubes, on the middle ear, producing chronic catarrh, with accompanying tinnitus, deafness, perhaps perforation, and suppurative discharge.

Diagnosis.—The serious mistake may be made of overlooking the presence of adenoid enlargement of the pharyngeal tonsil or the presence of adenoid tumours. Chronic coryza and hypertrophy of the tonsil may be considered to be the sole cause of the symptoms. Nasal or nasopharyngeal polypus are much less frequently confounded with adenoid tumours.

The symptoms of chronic coryza are so characteristic, that were it not that the inconvenience caused by these may cause the surgeon to overlook the presence of adenoid growths, we should have little danger of confounding the two afflictions.

The symptoms of *chronic coryza* are—permanent stuffing of the nose; alteration of the voice, which becomes more or less nasal; an abnormal secretion, with profuse flow of discharge, and sometimes to dried and firmly adherent crusts. The senses of smell and taste are dulled, and there is often a still more distressing symptom, the unpleasant odour of the expired air. If the obstruction of the nose is complete, it is followed by the consequences of respiration of the mouth. But these symptoms are occasionally due to adenoid enlargement and encroachment on the nasal fossa by the post-nasal growths. The safe rule to avoid any error of diagnosis is, in all cases in which we are consulted for these nasal troubles, whether deafness be a symptom or not, to explore by palpation, if posterior rhinoscopy be impracticable, the naso-pharynx and posterior nares. Anterior rhinoscopy by Zaufal's speculum or other dilator will assist in the diagnosis.

With regard to the part taken by *enlarged tonsils* in the production of the naso-pharyngeal symptoms and oral respiration, apart from the presence of adenoid growths, we must be guided by the size and position of the hypertrophied tonsil, an examination of the throat at once proving that these symptoms cannot be due to the tonsils. That hypertrophied tonsils may in themselves cause snoring at night, and closely simulate in their effects on respiration those produced by the adenoid growths, I have proved to my own satisfaction in several cases. The proof has been completed by the crucial test of removal of the tonsils, and the complete disappearance of the troublesome breathing. I cannot speak personally of the consequences of removal of the adenoid masses without amputation of the tonsils, as it is my practice always to remove these if enlarged.

Löwenberg says, and this is a matter of almost daily observation, that he has seen cases of enormous hypertrophy of the tonsils, which were free from all appreciable trouble, especially nasal respiration, and the important consequences which result from its suppression. On the other hand, in some cases of hypertrophy of the tonsils, in which these troubles also existed, he found adenoid growths hidden behind the enlarged tonsils. On the

removal of the tumours the symptoms disappeared, while the tonsils, to which these unpleasant results were attributed, have not been interfered with.

Here again examination of the posterior nares will decide the question whether or not adenoid growths complicate the enlargement of the tonsils. In the same way careful anterior and posterior rhinoscopy, aided, if necessary, by palpation, will detect a *polypus* both in the anterior and posterior nares.

Nasal Polypus.	Adenoid Growths.
Generally visible in anterior nasal fossa.	Never visible.
Sense of obstruction, or of the presence of a foreign body in the nasal fossa.	Generally absent.
Deafness not a result.	Deafness frequently a result.
Smell arrested.	Smell rarely arrested.
Occasionally discharge from nostril, with blood.	No bleeding.
Liable to recur after operation.	Do not recur after operation.
Growth more or less rapid, and apt to invade surrounding parts.	Rather stationary after a certain time, and localised.

In the case of naso-pharyngeal polypus the symptoms will depend upon its size. The following facts will distinguish it:—Its origin from the periosteum of the inferior surface of the basilar process (Lorrain, *Bull. de la Soc. de Chir.*, 260, 1860); the age of the patient met with after puberty generally; occur principally in males; frequently causes a peculiar wheezing respiration, with symptoms, if the polypus be any size, of dyspnoea; causes nausea and difficulty in deglutition; patient is liable to nasal haemorrhage.

Prognosis.—It is certain that as hypertrophy of the tonsil may disappear spontaneously in adult life, so do the adenoid enlargement of the pharyngeal tonsil of childhood and adenoid growths. Yet, in waiting for this spontaneous cure, we may permit the complications and functional disturbances to become permanent. They always are a source of irritation, which involves the Eustachian tube, while, if of large size, they must mechanically press on the tube and obstruct it. They thus interfere with the ventilation and equilibration of the air in the tympanic cavity, and may imprison mucus and inflammatory secretions

in it. Such consequences are most deleterious to the hearing, and, if permitted to operate for any time, must lead to some permanent change in the auditory passages.

Independently of this deleterious action on the ear, the oral respiration necessitated by the nasal obstruction may predispose to deafness.

Catlin¹ laid special stress on the habit of breathing by the mouth, which he designates *malo inferno*, or "the most destructive of habits." Amongst two millions of Indians whom Catlin examined, he did not find one individual

and tonsillar hypertrophy, if radical means be adopted to cure those states. After removal of the growths they do not recur, and the deafness disappears, its relief being aided by other means for restoring equilibration in the tympanum.

Treatment.—This must depend to a great extent on the size, position, and shape of the masses, whether they are sessile or otherwise. We may deal with them either by operative means or by cauterisation of the growths. The operative measures can be carried out either with a Löwenberg's cutting scissors, his post-nasal curette, or the finger nail.

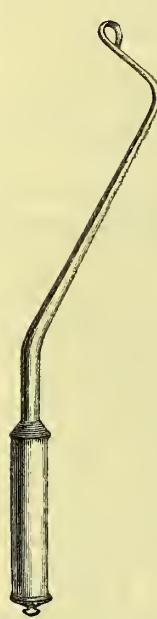


FIG. 118.—Post-nasal Curette.

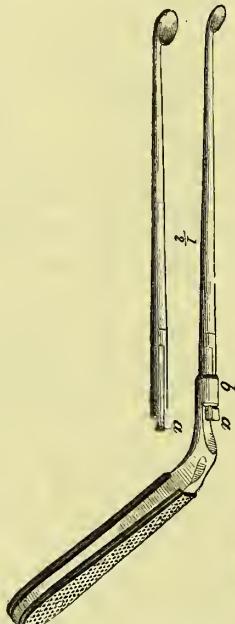


FIG. 119.—Post-nasal Spoon of Volkman (Mackenzie).



FIG. 120.—Löwenberg's Forceps (post-nasal).



FIG. 121.—Mackenzie's Forceps (post-nasal).

who breathed by the mouth, nor a single deaf one, with the exception of three or four deaf mutes.

Not one, among 150 chiefs, with whom he conversed, could remember, during the last ten years, a single comrade deaf, or even with defective hearing. Catlin attributes this to a practice of the Indian mothers, who close their children's mouths each time that they breathe through them.

In no class of case may we speak more hopefully of the restoration of hearing than in the instance of children whose deafness is due to adenoid enlargement

¹ Catlin, *History of the North American Indians*

Meyer's oval cutting ring, or the finger sheath of Capart, with its cutting spoon, may take the place of the latter. We introduce the ring with the right hand, by the nares, on whichever side enables us most easily to reach the morbid growths, till it is passed into the pharynx; then the left index finger is introduced by the mouth, in order to fix the morbid growths, and to press them against the sharp edges of the knife.

The curette or finger nail are only available in the case of sessile tumours of a soft character. These can be scraped away by either of these methods. Mackenzie's sliding forceps answers the pur-

pose well. The curette of Löwenberg must be guided to the growths by the index finger of the left hand, which is used to fix these, and then by a scraping movement and pressure on the soft masses they are removed. The pedunculated growths can be snared with a post-nasal snare or ecraseur. But for all growths of larger size the cutting or crushing forceps of Löwenberg is the best instrument (Solis-Cohen uses a similar forceps). Dr Woakes has slightly modified the cutting blades of Löwenberg's forceps.

Guided by the index finger of the left hand, the forceps is introduced closed. On reaching the growths the blades are opened, and they are cut as closely as possible to their base. A thin pedicle, or a sessile growth of small size, may be cut through by one stroke of the instrument. The galvano-cautery may also be used for the removal of adenoid tumours.

Lincoln has devised a special electrode for destroying the post-nasal growths. It is safe and simple. The platinum disc of the cautery is completely shielded by bone, and is not exposed until it is brought into contact with the part.

We may cauterise the sessile growths or use astringents to moderate or prevent their development. Both nitrate of silver and chromic acid (3*i.* ad. 3*i.*) can be employed for this purpose. With both these solutions care must be taken to press out the superfluous liquid from the absorbent wool before its application, so as that none may drop into the larynx. We fuse the nitrate of silver, or a mixture of the salt and nitrate of potash in a little platinum crucible sold for the purpose. A

ping out the posterior nares, either through the nose or by the mouth, this probe or cotton-wool holder will be found most efficient.

It is difficult to avail ourselves of these means with young children, who do not well tolerate the rhinoscope. Löwenberg employs a caustic holder terminating in a prism, which is protected by a caoutchouc tube so as to avoid cauterising the pharyngeal wall. To avoid any unpleasant results of the caustic the patient should be previously accustomed to the use of the naso-pharyngeal douche, and taught how to gargle the throat lying down. Warm water and common salt (gr. xx. to 3*i.*) may be then used to neutralise the effect of the caustic if it be severe. But resort to such modes of treatment is seldom necessary unless operation be absolutely declined, for the simplest and most efficacious means of curing adenoid growths of the naso-pharynx is by any of the operative steps above detailed.

FIG. 123.—Post-nasal Applicator of Politzer.

In the treatment of children affected with these adenoid growths, we must not overlook the accompanying temperament and state of the child's health generally. Löwenberg rigidly insists on the value of hygienic and constitutional treatment combined with and apart from the operative. The lymphatic diathesis should indicate the use of such remedies as iodide of iron with cod-liver oil, and such preparations of iron and the hypophosphites as those of Fellow and Dusart. Malt preparations and peptonised foods are indicated in cases of weak digestion and assimilation. Milk should be the principal article of diet given in various ways. Attention to the several matters alluded to in the chapter on Hygiene, as clothing, bathing, exercise, is of great importance.

The child's habit of breathing with the mouth open should be attended to.



FIG. 122.—Platinum Crucible.

platinum probe, roughened at the end, such as that used for uterine purposes, can be curved to the proper shape to pass behind the palate, and then dipped in the fused salt. Guided and protected by the index finger the caustic may be applied to the part. When solutions are used the same form of probe, with a screw-end to which cotton-wool is firmly attached, may be employed. The curved end is dipped in the solution and then carried to the naso-pharynx. For mopping



Much may be done to correct this habit by friends and nurses reminding the child to close the mouth. Löwenberg devised a chin-piece to keep the teeth of the upper and lower jaw in apposition. Any parent or nurse can be taught to make from a piece of ordinary roller the four-tailed chin bandage, and to

apply it in the same manner as we do in fractures of the inferior maxilla; or a simple cotton-wool respirator with tapes at the side to fix to the head, may be prepared in any home. These contrivances are applied at night, and will in a short time encourage the independent habit of breathing through the nose.

CHAPTER XV.

SOME AFFECTIONS OF THE MIDDLE EAR.

MYRINGITIS—CRETACEOUS DEPOSITS ON THE MEMBRANE—SIMPLE CATARRH OF THE TYMPANUM, ACUTE AND CHRONIC—EUSTACHIAN COLLAPSE—OBSTRUCTION AND CLOSURE—SIMPLE ACUTE CATARRH OF THE TYMPANUM—CHRONIC CATARRH—ACUTE SUPPURATIVE CATARRH—CHRONIC SUPPURATIVE CATARRH—PERFORATION OF THE MEMBRANA TYMPANI—TENOTOMY OF THE TENSOR TYMPANI.

MYRINGITIS.

Inflammation of the Membrane—Myringitis.—There can be no doubt that the dermoid layer of the membrane may be attacked with acute inflammation and yet the tympanic cavity itself escape. I am not inclined to look on acute inflammation limited to the membrane as of such extreme rarity as many authors suppose. If this be not strictly true in an anatomical sense, it is undoubtedly a matter of common clinical experience that inflammation of the external meatus spreads to the membrane, as it is that catarrhal conditions of the middle ear expend their force on it. Yet, independently of any previous external or middle-ear inflammation, I have several times had patients in whom inflammation—beginning in an injected state of the drum-head, running on to a general redness, these vascular changes being accompanied by severe intermittent shooting pain—has culminated in perforation, and has slowly subsided under treatment, without any permanent effect on the hearing. I have seen such inflammation, with permanent deafness, result from an injury, as a blow of the fist on the ear. As Burnett says:—“There may be an inflammation localised in the membrana tympani, the external auditory canal being free from inflammation. It would seem but fair to give

the name of myringitis to such a disease, and mark it out for special treatment.” He looks on myringitis as always “an inflammation of the dermoid layer of the drum-head.”

I have not the least doubt, from the observation of a large number of cases, that this strictly localised inflammation does frequently occur. More frequently, however, do we find the membrane inflamed after the occurrence of a small abscess in the external meatus, or inflammation attacking it in consequence of exposure to cold, or after catarrhal conditions of the throat and naso-pharynx, in which the Eustachian tube and tympanum are involved.

Symptoms.—The delicate membrane may be the first part to attract attention to the mischief by reason of the pain, tinnitus, and throbbing which usher in an attack. Very often such a case as this presents itself. A patient has become slightly deaf in one or both ears, there is a dull, periodical pain, the external passage is sensitive if we stretch the auricle or insert the speculum. On examining the ear we find an injected state of the meatus near the membrane, and the membrane itself, with the manubrium, unusually vascular; or perhaps things have gone a stage further—the pain is more severe and constant, especially at night; there is marked tinnitus, the patient frets, is generally unwell and

weak ; the movement of the jaw in masticating gives pain. On examining the membrane there is a full and bulged or flattened look. Perhaps the normal concave appearance is lost, and the whole membrane presents rather a convex surface, giving us the idea of concealed fluid in the drum cavity. I have occasionally such cases, and have had no result, so far as evacuating any imprisoned fluid.

Keu
I have often seen a slight myringitis accompany that severe neuralgic pain for which we are so frequently consulted.

Treatment.—In the treatment the main object is to arrest and limit the inflammatory process while we relieve the pain. Frequently, notwithstanding any means that we employ, acute perforation will occur, or at least some superficial ulceration of the drum-head. We often find that patients who suffer from myringitis are out of sorts. There is some cause for worry, and a general debilitated and relaxed state of the entire system. Under these circumstances I am in the habit of giving quinine, in 5 grain doses, by itself, or combined with iron. Bromide of potassium, in 15 and 20 grain doses, combined with hydrate of chloral, taken at regular intervals, is a good combination to assuage the pain. The local application of ethylic ether, or cocaine in the meatus, I have found of service. Warm laudanum fomentations and the instillation of warm laudanum solutions are soothing. The first step, however, is depletion of the ear (*vide* General Therapeutics, chap. viii.), followed by warm sedative fomentations, while great relief will often be obtained from vesication over the mastoid (application of iodine pigment or liq. epispasticus). The throat should be carefully attended to, the ear inflated, and the Eustachian tube kept free, while its faucial orifice, if there is any congestion, may be daily touched with a nitrate of silver solution. Dr Blake, in the acute stages, scarifies the membrane, making a few cuts in the prominently congested parts. Should there be fulness and bulging of the membrane, and that we fear any accumulation in the tympanic cavity, it is far better to perform paracentesis.

As regards local douches, I prefer very mild soda, or common salt or muriate of ammonia (2 to 5 grains to the ounce), to which is generally added a little glycerine,

the basis being carefully-strained poppy water. Change of air will be imperatively required should the attack become intermittent ; and it is well, if it can be done, to send the patient for a time from home.

CRETACEOUS DEPOSITS ON THE MEMBRANE.

Often associated with catarrhal conditions of the tympanum we find these deposits, which are easily recognised. They appear as white layers of a chalky substance. They may exist without much disturbance of hearing, and frequently are to be found in one ear only. A lad of 18, whose hearing in the left ear was normal, consulted me for obstinate deafness in the right ear. The two pockets were covered with irregular-shaped white masses of a chalky substance (*vide* fig. 3, plate I.). The tuning-fork was heard less loud in this ear, and inflation of the membrane was attended with a dry sound. I did not interfere. A drawing of this case, and others of the same nature, I included in my *Atlas*.

I was consulted by an officer for constant tinnitus in the right ear. The deafness had lasted for ten years ; it was rather worse of late ; he had been twelve years in India ; the tinnitus commenced after his return home, and the deafness grew worse. There never had been any pain ; there was no family history of deafness. The watch was not heard on contact. There was a crescentic cretaceous mass on this membrane (fig. 124), and on inflation there was a dry and grating sound. The tuning-fork was heard only in the left ear, whether placed on the head or the teeth. He suffered from giddiness at times, and tendency to fall. When the secretions were irregular, or that he was "billious," the tinnitus, he said, became much worse. Nothing relieved him. Hydrobromic acid and bromide of potassium cured the giddiness, but the tinnitus yielded to no treatment.



FIG. 124.—Crescentic calcareous mass.

SIMPLE CATARRH OF THE TYMPANUM—ACUTE AND CHRONIC.

Trötsch divided aural catarrh under

these heads:—Simple acute and simple chronic, subdivided into dry and moist; acute suppurative catarrh; chronic suppurative aural catarrh, or chronic otitis media.

The following views of Weber-Liel on the etiology of simple aural catarrh of the tympanum are those I would urge on the attention of practitioners:—(1) There arises from the paralysis of the tensor veli collapse of the walls of the Eustachian tube, and therefore hindrance of the proper continual ventilation of the tympanic cavity; (2) allowing that the tensor veli acts as an antagonistic to the tensor tympani, when the elastic strain and contractility of the tensor veli is entirely or partially paralysed, not only collapse of the tube occurs, but an antagonistic contraction of the tensor tympani also; and so, the want of air in the tympanic cavity being added to the effect of the anomalous straining of the powerful system of active factors in the mechanism of the tympanic cavity, a high degree of nutritive and functional anomaly in the cavity and labyrinth must in time be occasioned.

Weber-Liel¹ thus classified the causes of aural catarrh:—(1) Extension of a simple catarrh from the Eustachian tube and the pharynx-nasal cavity; then the latter only must be the object of treatment; (2) collapse of the walls of the Eustachian canal, dependent on insufficient or paralysed action of the Eustachian-tube muscles; (3) alterations of the vaso-motor and trophic nerves supplying the tympanic cavity (*Proceedings of the Medical Congress, Amsterdam, 1879*, “On Intratympanic Injections”).

Thus arise many cases of catarrh of the middle ear, from the hyperæmia *ex vacuo*, caused by the rarefaction of the intratympanic air, and the retardation of the tympanic and intratympanic circulation by the increased amount of strain and limited motion of the structures from the abnormally contracted tensor tympani. This double effect of air in the cavity and contraction of the tensor tympani cause (1) an abnormally strong tension of the tympanic membrane, (2) an

abnormally tight fixation of the chain of ossicles, and (3) an increase of the intra-labyrinthic pressure, since the stapes is pressed into the labyrinth by the ossicular chain. Thus the reception and conduction of the vibrations and the vibrating capability of the implicated portions are much prejudiced. As the functional expressions of these disturbances, arise subjective auditory sensations, and frequent sensations of faintness.

At the beginning of the affection disturbances of hearing may seldom be present, or they are not then noticed as deafness, but rather as acoustic hyperesthesia for certain noises; and gradually defects in the capability of hearing, especially during mixed conversation, make their appearance, and again are followed by symptoms which are spoken of as “accommodative disturbances”; and now, when the other ear begins to suffer, the tinnitus gradually arises and increases. For a long time there is nothing save singing noises in one ear, one ear being always first affected; the other one following after some time.

The collapse of the tube and the abnormal contraction of the tensor tympani continuing, there develop in time secondary changes in the sound-conveying apparatus. The hyperæmia of the tympanic cavity already present often increases through the passage of catarrhal conditions from the pharynx to the now easily affected parts, and intratympanic exudations are easily produced by slight attacks of cold. The structures in the tympanic cavity being, on account of the defect of air in the cavity, approximated to each other, give these exudations points for adhesive attachments. A not necessary but very frequent consequence of the continual impressing and fast fixing of the stapes in the *fenestra ovalis* is a synostosis of the stapes, and other anomalies in the joints of the ossicles; the local hyperæmia, which is especially marked in individuals of the gouty, rheumatic, and syphilitic diathesis, playing an important part in the production of such changes. In time the hyperæmia of the tympanic cavity lessens, the “stanungs-hyperæmie,” leads to interstitial connective tissue growth, and, wasting of the vessels and trophic changes of different kinds are seen, atrophy of the tympanic membrane being common.

¹ For the observations in the text I was indebted, in the first instance, to Dr Weber-Liel, who sent me, with some few alterations and additions, the summary of a review by Dr Laidlaw Purves of Dr Weber-Liel's work on *Progressive Deafness* (1873).

It is comprehensible that in time, changes in the circulation and nutrition of the labyrinth must also occur, not only on account of the continual and increasing pressure from the cavity, but on account of the difficulties under which the conducting apparatus must act.

It is a matter of observation that such patients at the beginning of a conversation often hear moderately well, but when the affected ear has been strained for an hour or so they complain of giddiness and increased tinnitus (spasmodic contraction of the tensor tympani), which symptoms can only be referred to an increased flow of blood to the labyrinth. Pulmonic and hepatic congestion increase (through the connection of the labyrinth with the arachnoidal space through the ductus cochlea) this trouble.

The snapping noises heard in certain catarrhal states, Dr Weber-Liel accounts for by the separation of the moist walls of the Eustachian tube in swallowing.

Weber-Liel still adheres strongly to these views on the subject of aural catarrh. He does not regard pharyngeal catarrh as such a direct cause of aural mischief as some would insist. In most of those cases of aural catarrh, he is of opinion that the accompanying difficulties in singing, swallowing, or in insufflating by Politzer's method are due rather to a collapse of the tube walls "through the abolition of the counter-straining force of the antagonistic muscles"—it is not a catarrhal state, it is rather paretic—"we can pass a bougie when the air douche will not act."

EUSTACHIAN COLLAPSE, OBSTRUCTION, AND CLOSURE.

Most frequently the origin of both acute and chronic (non-suppurative) catarrh may be traced to some abnormal state of the Eustachian tube. The study of the various diseases of the ear which follow abnormal conditions of the Eustachian tube, shows that the healthy or unhealthy state of this canal offers to us a clue to the causes of by far the largest proportion of aural complaints.

Causes (see chapter on Etiology).—The exciting causes of Eustachian closure may be simply cold "caught" in any way; exposure to draughts, damp, rheumatism, sea-bathing, exanthemata,

mental shocks, &c., are some of the most frequently assigned. During a cold every one is familiar with the sense of stuffing in the ears, and the muffling of sounds or tinnitus which occasionally accompanies it. On examining the throat, we may find the mucous membrane swollen or turgid, there may be a granular state of the pharyngeal membrane, the follicles are enlarged, perhaps the uvula is relaxed, or the tonsils are hypertrophied. The faecal orifice of the Eustachian tube is likewise swollen; and in consequence there is temporary closure of the passage, and secretions are imprisoned in it. When this condition persists for a time we see the characteristic dull membrane of Eustachian closure. Little air enters the tube, and the air in the tympanum is rarefied; this results in an increased concavity of the membrane. Hinton described this form of membrane as characteristic of Eustachian deafness. "The malleus appears foreshortened, and the membrane has a tense stretched look, like a drawn curtain, often falling into similar folds. The colour varies, is generally white and dull, but sometimes, especially in the earlier stages, the congested mucous membrane of the tympanum shines through it." When inflation is resorted to, we hear the sound with the otoscope either not at all, or with great difficulty. This simple swelling of the Eustachian tube, beginning with a slight deafness, and perhaps a little earache, which at first may be periodical and remittent, finally becomes chronic and permanent. It may or may not be a considerable time, dependant to a certain extent on the mischief attacking only one or both ears, before troublesome deafness, accompanied by tinnitus, occurs.

Nothing in the whole range of medical practice is more astonishing than the extent to which persons permit aural mischief to proceed before they seek relief, the more so if only one ear be affected. Often it is the incessant tinnitus that forces them to apply for relief and not the deafness. If the closure and obstruction lead to other results, say acute inflammation (suppurative catarrh) of the tympanum, and perforation of the membrane, as it frequently does, then they apply for relief from the symptoms which accompany these lesions.

We may thus summarise the ordinary effects of Eustachian collapse and closure. Slight catarrhal inflammation, which is the consequence of the primary affection, leads to an accumulation of mucus. This mucus increases in quantity and is imprisoned. It may become hardened and form hard masses both in the tube and the cavity of the tympanum, about the chain of ossicles, and on the membrane. A chronically collapsed and closed Eustachian tube, leading to imprisonment of mucus and alterations in the position and structure of the *membrana tympani*, followed later on by permanent change in the shape and appearance of the latter with adhesions, ankylosis of the ossicles, and hardening of the mucus, are the usual effects which ensue on a common cause, viz., a catarrhal state of the naso-pharyngeal mucous tract.

Dr Weber-Liel¹ thus summarises the causes which contribute to relaxation, insufficient action, and paralysis of the tubal muscles and *velum palati*. General weakly conditions from disease, parturition, excessive exertion, unhealthy conditions of life (nervous exhaustion, masturbation), will have disturbing influences on muscles already weak, and this is often the case with the muscular apparatus of the tube. The muscles of the tube of the left side participate in the general more feeble development of that side, and he thinks that the affection nearly always begins on the left side. Chronic catarrh of the mucous membrane covering the muscles appears to have often been the starting-point of defective functional ability of this group of muscles. In nervous individuals, in those much affected by grief or care, with different nervous lesions (*e.g.*, of the *trigeminus*), the innervation of this portion is very easily disturbed under disposing influences. Rheumatism, tubercle, typhus, diphtheritis, progressive muscular atrophy, chlorosis, and anaemia are amongst the predisposing causes.

SIMPLE ACUTE CATARRH.

Course and Features.—We find that the various forms of catarrh above enumerated are the result of different degrees of inflammatory action occurring in the tympanic cavity or the passages.

¹ *Op. cit.*, p. 124.

The inflammation may be acute, and not pass into the purulent form. The secretion is increased, but preserves its mucoid nature, mucus becomes accumulated in the tympanum, and if it is not allowed a means of exit by paracentesis of the membrane, this accumulation leads to a chronic catarrhal condition of the tympanum in which the bones and tympanic mucous membrane become affected.

Simple catarrhal inflammation seldom causes perforation. Should it occur in the acute form, there is the advent of the slight deafness (which is not rapid); the pain is slight, rather in many cases described as an "uncomfortable feeling" about the ear, possibly some tinnitus; both accompanying a sore throat, or a slight attack of tonsilitis; there may be nasal catarrh, perhaps some headache or accompanying neuralgia, and pain in the ear in coughing, sneezing, or swallowing, and at times in talking. On examining the drum-head, we can perceive but little alteration from its normal condition; it may have lost its usual translucent appearance or appear slightly injected. The vessels may be injected, the entire membrane being altered in colour. The prominent full and red appearance of the membrane is characteristic. If secretion rapidly occurs the pockets might be bulged out by the imprisoned mucus. In the naso-pharyngeal tract we are likely to find swollen Schneiderian membrane, swelling of the Eustachian tubes, enlarged tonsils, paresis of the *velum palati*, and general congestion of the pharyngeal mucous membrane.

Treatment.—In simple acute catarrh of the tympanum the indications for treatment are much the same as in inflammation of the membrane (see *Myringitis*). Added to these, we must pay special attention to the naso-pharynx and the condition of the Eustachian tubes. (For directions for the relief of pain, depletion, fomentation, and other general treatment, the reader can refer to the chapters on *General Therapeutics* and the *Management of the Naso-Pharynx*).

SIMPLE CHRONIC CATARRH.

Symptoms.—Frequently a patient presents himself with a history of a recent cold, or it may have been a throat attack,

and this has been succeeded by a slight deafness and tinnitus generally of one ear. On testing the hearing with the tuning-fork, we find that it is heard loudest in the affected ear, and that there is no marked difference on closing the meatus of this ear; that is, the tuning-fork is not then heard louder. There may be conveyed a moist or gurgling sound with the otoscope. The membrane has perhaps lost its transparent look; it is either concave and of a dull or greyish-white colour, or it is rather convex. We may at once suspect a recent acute catarrhal attack, passing into a chronic stage with an accumulation of mucus in the tympanum. We more frequently, perhaps, meet chronic cases in which no treatment has been pursued, or, if any, some useless empirical course of blistering and leeching, which has been energetically pushed, with a pleasing variation in the administration of remedies internally, while the tympanum has been all the time gradually filling with dry mucus, hardening and producing, it may be, irremediable changes. In such patients we frequently find a dry external meatus—the wax is not secreted. As to the appearance of the membrane in cases of accumulated mucus, I must confess that in my experience there is no one form characteristic of this condition. It may bulge forwards in any part, or appear as if the entire membrane was pushed outwards; or, on the other hand, it may appear abnormally concave, and this bulging or concavity may be accompanied by every variety of change in the position and shape of the membrane, and irregularity in the position of the malleus.

These alterations in the form of the membrane do not frequently bear any definite relationship to the degree of deafness or the tinnitus. The membrane may appear but slightly changed, and yet the deafness and tinnitus be extreme.

It is, indeed, often very difficult to diagnose positively the presence of mucus in the tympanum, especially in old chronic cases complicated with other lesions, whether of the nerve, ossicles, or membrane. In such cases, for instance, the operation of paracentesis must be purely experimental, and may be, and often is, followed by negative results. Yet in many patients where we

do not succeed in obtaining any proof of the accumulation by evacuating the mucus, still we have the satisfaction of seeing them benefited by the treatment, and the hearing decidedly improved.

There can be no doubt that nerve impairment frequently attends on the presence of mucus in the tympanum. Thus I have on many occasions noticed that severe mental shock, the occurrence of a fever with brain complications, have produced the nervous derangement, while an accompanying relaxed state of the throat has left imprisoned secretions in the tympanum. So, in other cases, a gouty or syphilitic taint has often been the source both of the nervous derangement and of the accumulated mucus (*vide* chapters on General Etiology).

Treatment.—The treatment of simple chronic catarrh of the tympanum involves so much that has been said on the therapeutics of the ear generally, that the reader must refer to the chapters on General Etiology and Therapeutics for the necessary information as regards the prophylactic and other treatment of this common affection. I propose in this chapter merely to make some observations on some special forms of treatment, several of which are elsewhere fully dealt with.

Weber-Liel lays special stress on the methodical practice of gymnastic exercises with the muscles of deglutition and respiration and of the Eustachian tube, while we combat the general debility by such means as a sea voyage, a tonic regimen, and the internal administration of the salts of iron, strychnine, quinine, &c.

In the treatment of all conditions supervening on a closed or obstinate state of the Eustachian tube, the first matter is to secure its patency. The method of doing this I have already dwelt on—catheterisation, assisted if necessary by ordinary or laminaria bougies (very fine), about half a line in diameter for the narrowest part of the Eustachian tube, and if a laminaria bougie is used in addition to the catheter, it must not be left in longer than twenty minutes. The bougie is passed through the catheter, and the catheter is withdrawn before the bougie. Various sizes of bougies may be introduced through the catheter, which can be withdrawn

with the bougie, so that we may prevent the latter being injured.

Amongst the drawings in my "Atlas" is one typical of a class of membrane frequently found as the result of closure of the Eustachian tube, and accompanying this condition. The membrane has characteristically thin appearance seen in complete collapse. On inflation, the lower portion of the membrane was blown out like a thin bladder. The upper part was bound by adhesion to the inner wall of the tympanum. Hinton graphically describes this state under the head of "Collapse and Rigidity of the Membrane," and he notices the fact, illustrated in the above-mentioned case, that the hearing power is often good. He advised, when the membrane lies in contact with the tympanic wall, the application of the artificial membrane.

Suction of the meatus will be found of service in these collapsed conditions of the Eustachian tube. This is best effected with the pneumatic speculum, through which we can at the same time see the extent of the adhesion. It is a good plan to give a patient a piece of tubing with an ear-piece covered with india-rubber to fit the meatus air-tight, and instruct him to apply suction with the mouth through the other end. This plan of suction and inflation practised by the patient himself may be followed up by the incision of the membrane, tenotomy, or, in rare instances (Hinton), an attempt may be made to restore the malleus to a normal position, as by doing so we free the stapes. This, however, is a step not to be lightly undertaken, as it requires the most delicate manipulation to cut round the adherent malleus or stapes, and raise them by the gentlest of pressure into a better position. Politzer's plan of "air-tight closure" of the meatus when the membrane has been well inflated, may be found useful in these cases of collapsed membrane. A piece of cotton wool is rolled into a ball with some cord or softened wax, and after a powerful inflation of the membrane, the meatus is plugged with the ball. This the patient can do himself, wearing the ball at night, and periodically omitting it.

The treatment of accumulated mucus must to a great extent depend on the duration of the affection. If recent, and

that the accumulation has not gone to a great extent, we can do much by warm alkaline injections (2 to 5 grains to the ounce) of carbonate of soda, iodide of potassium, common salt, chloride of ammonium, &c., into the tympanum; also by injection of sulphate of zinc (2 to 5 grains to the ounce), or the passage of iodine vapour. Such means, combined with the free use of the air douche and the nasal syphon douche, often afford complete relief (see chapter on General Therapeutics and the Therapeutics of the Naso-Pharynx). For the systemic states accompanying the tympanic trouble, perchloride of iron in combination with strychnia, where there is general debility, is a most valuable combination. At times, in hysterical patients and delicate women, bromide of potassium, or bromide of ammonium with iron, or the salts of zinc, bromide, and phosphide, I find most useful.

For the tinnitus, the internal use of bromide of potassium and hydrobromic acid, hydrobromic ether, and the nitrite of amyl may be tried (see, more fully, Treatment of Tinnitus). Iodide of potassium in gouty and syphilitic systems, and also bichloride of mercury in the latter, are of service. Thorough cleaning out of the Eustachian tube and tympanum, combined with such internal remedies as give tone to the system, at the same time that we keep the secretions regular (with such waters as Friedrichs-hall, Victoria aperient, and Hunyadi Janos), is a summary of the treatment of such accumulations in the tympanum.

I have elsewhere alluded to the question of artificial perforation of the membrane and the mode of performing the operation. Whatever doubt may remain as to the propriety of this step as an experimental effort in obscure cases of deafness, especially when complicated with troublesome tinnitus, combined at times with division of the tensor tympani, none can exist as to its utility, where accumulated and imprisoned secretion is ascertained to be the cause of the trouble, or in those acute cases, before referred to, which are so ambiguously grouped under the heading of "acute aural catarrh," and in which the pent-up secretion is prone to assume the suppurative character. Not long ago I had a patient who came to me extremely deaf, not hearing the watch when pressed to the ear, and whose conversational

hearing power was very bad. There was an old syphilitic history. The tuning-fork was well heard, but closure of the meatus produced no difference, the membrane had a bulged appearance, and the sound with the otoscope was of a gurgling character. I determined to incise, and accordingly, after some previous syringing with warm iodide of potassium, punctured both membranes and kept the apertures free. I succeeded in getting a quantity of semi-transparent mucus of a brownish colour through both openings. This man, with his face averted, subsequently heard me conversing in a low tone across my study. I have just such another case attending me at the present moment, in which the previous warm syringing of iodide of potassium solution, through the tympanum, preparatory to puncture, has produced considerable benefit. Perforation of the membrane was followed by a marked and still further improvement.

In most cases of Eustachian closure I rely mainly on warm carbonate of soda or chloride of ammonia injection, and the frequent use of Politzer's bag (see General Therapeutics—Eustachian Tube). The nasal douche of salt water is of great benefit, and also gargling with cold alum water while lying in the horizontal position. Constantly we meet patients who cannot use the syphon douche. The simple sniffing up of a warm solution of salt is a capital substitute for the use of the nasal hand spray. About an egg-spoonful of common salt may be added to two wine-glasses of tepid water used once daily. If suppurative catarrh leading to perforation occurs from closure of the Eustachian tube, we must be satisfied with the gentle washing out of the tympanum daily, with a warm solution of chloride of ammonium or carbonate of soda, while we attend to the inflammatory condition of the membrane by warm fomentations, gentle syringing with anodyne and alkaline washes, leeches, or vesication.

Weber-Liel has specially urged the value of iced water applications in the treatment of acute catarrhal inflammation in the middle ear, more particularly for the relief of pain. The douche of Politzer must not be used during the acute stages, and only with caution on the subsidence of the inflammation or if perforation has occurred. In such cases, if there is any

occlusion of the Eustachian tube, it is preferable to use the Eustachian catheter and small bellows, combined with the passage of a bougie. In rheumatic otitis media, turpentine and salicylate of soda are indicated, Weber-Liel speaking very highly of the former remedy.

ACUTE SUPPURATIVE CATARRH.

Course and Terminations.—Very different is this affection from the non-suppurative variety; we have it typically represented in the attack which accompanies or follows scarlatina or an infectious fever. We have generally severe constitutional symptoms, violent pain, tinnitus, deafness, attended at times by vertigo and discharge of pus from the meatus. Perforation of the membrane occurs in periods varying according to the severity of the attack. It is in the neglect of the warning afforded by the aural mischief, the attention of the medical man being diverted by complications, such for example as convulsions in young children, that the surgeon is so apt to commit an error. Irreparable deafness—perhaps deaf-mutism—is the consequence. The acute stage may end in a chronic inflammatory state of the tympanic cavity, with retention of pus in it; or it may terminate in a spontaneous perforation, the membrane rupturing and giving vent to the imprisoned secretion. The pus may find its way into the mastoid cells, giving rise to abscess in these, or perchance the mischief may extend to the brain itself, giving rise to inflammation and meningitis, and, worse result of all, cerebral or cerebellar abscess.

Symptoms.—If we examine the membrana tympani before such perforation takes place we find it either deep red or generally of a bright pink colour, it has a swollen appearance from the gradual obliteration of the pockets and malleus, which goes on until the membrane has lost completely its normal character. Such a membrane is represented in the "Atlas," that of a little girl who died of brain complications a few days after the drawing was made. Often, after perforation has occurred, pain may abate totally or partially, or intense pain may continue with a pulsating perforation. I once had such a case, where, after acute suppurative inflammation terminating in

perforation, notwithstanding everything that could be done, the brain was attacked and death ensued within ten days from convulsions. The little girl above alluded to was a very rapid case, death occurring in some few days from the onset of the symptoms, there being here no perforation, and the parents absolutely refusing interference. She died from the supervention of convulsions. This was just one of those cases where close attention to the ear and incision of the membrane might have saved life. In children especially, this brain mischief is apt to creep on unperceived. The rapidity with which cerebral complications sometimes make their appearance in the midst of perfect health, in cases of long-standing ear disease, should always be borne in mind. Increase of pain and deafness with constitutional symptoms, such as rigors, high temperature, furred tongue, rapid pulse, mark the outset of the mischief, and as the discharge from the ear may cease, attention is diverted from this organ. At times, notwithstanding every effort, the patient rapidly succumbs. The pain increases in the ear, and radiates over the entire head. The pulse falls, the bowel is costive; obstinate vomiting may ensue. The mind generally remains clear, but finally the patient sinks comatose or convulsed.

Causes.—There can be no doubt that the exanthemata furnish most frequently the starting-point of the disease. Cold, exposure to draughts, blows on the ear, the vile habit of boxing the ear—the causes enumerated as operating in myringitis and simple acute catarrh (see chapter on *Etiology*), may give rise to the mischief. I have referred to the effects of cold bathing in producing inflammatory catarrh of the tympanum. Burnett draws attention to the close relation of the molar teeth to the tympanum, and the possibility of an error in diagnosis being made through mistaking the pain of decayed teeth for earache. "Whenever," he says, "we find earache without sufficient objective symptoms to account for its cause, it is never amiss to inquire after the teeth."

Treatment.—The treatment consists in warm anodyne fomentations, applied externally, or by gently washing out the meatus. Subcutaneous injections of morphia, the free application of leeches,

vesication over the mastoid, and incision of the membrane if we suspect pent-up secretion, and incision over the mastoid process, or the use of the trephine if there be swelling and other signs pointing to the presence of purulent matter in the mastoid cells (see *Remarks on Inflammation of the Mastoid Process*). On two occasions I have seen life directly saved by a free incision made down to the mastoid process, this incision being followed by the escape of pus and dead bone. At the same time the constitutional symptoms should be attended to, the bowels carefully relieved, and a saline given internally, while a combination of bromide of potassium and hydrate of chloral, with the local applications of the vapour of bromide of ethyl, cocaine, laudanum, may relieve the pain.

CHRONIC SUPPURATIVE CATARRH OF THE MIDDLE EAR.

Course and Terminations.—This affection may follow as a result of the acute form. Suppurative catarrh, acute or chronic, is often shamefully neglected in children; the younger the child, and therefore the less competent to make its complaint known, the greater the probability of neglect. Aural mischief is, in a very young child, often masked by symptoms that direct attention to the other parts, the brain, stomach, or the teeth. Discharge from the ear is long neglected, and the ignorance of its cause or the results of its continuance induce many to fancy that to arrest it is a mistake. Therefore it is that in children, where there are obscure head-symptoms with feverishness and restlessness, the surgeon should always examine the ear. The carrying of the hand to the ear is often the only indication of any local mischief. Otorrhœa continues often for a long time in children with but little effect on the hearing, and no pain. When the ear is seen for the first time there is frequently perforation of the membrane, a granular state of it, or polypus. The present neglect of aural complaints in young children is a fact that cannot be too strongly animadverted on. Too often it unfortunately happens that the surgeon is asked for advice only when irremediable and fatal brain complications have arisen. If this be culpable

on the part of friends, how much more so in the case of the medical adviser, who, through carelessness, has permitted these warnings to pass unheeded, which might, if noticed in time, save life.

Scarlatina and diphtheria are the two acute diseases that most frequently bring about this condition. In the early part of this work I dwelt on the absurd popular prejudice regarding discharges from the ear, and the dislike of parents to interfere with them. This often leads to neglect at home, and accounts for the late period of the affection at which the physician is consulted. Thus when the child is seen the otorrhœal discharge fills the meatus, blocks up the canal, obscures the tympanum, destroys the ossicles, having long since escaped through the perforated membrane, and yet the patient is not brought for relief until the unpleasant deafness renders it inconvenient for teacher or parent. Too frequently has the disease made inroads into the labyrinth or attacked the nerve. The tympanic cavity has cakes of old hardened masses of epithelium and pus, with aspergillus that have developed in the decaying débris. These are of all cases the most insidiously dangerous. Perhaps the discharge has ceased to flow from the meatus in consequence of the complete blocking up of the tympanum, or the closure of a perforation or the collection of cerumen in the external auditory canal. Meantime mischief has been advancing in the petrous portion of the temporal and the adjacent surfaces of the brain membranes. Any form of brain trouble may be the consequence.

Some years since I lost a valued friend with just such a train of symptoms as those above mentioned. He had been a patient of Mr Toynbee's, and had occasional discharge from the ear, and a large perforation which was never properly healed. This discharge broke out occasionally, and caused him great annoyance. Suddenly, before the fatal attack, it ceased. He was seized with violent pain, and he died in a few days comatose.

Turnbull and Cassells have both discussed the question of the influence of a chronic discharge of the ear, on the question of life insurance. There cannot be the least doubt that the existence of such a discharge may invalidate a life insurance, and that the concealment of

such a condition or any chronic disease of the ear, might cause the question to be raised of the *bona fide* nature of an insurance contract.

I am aware of five cases in which death by pyæmia from implication of the lateral sinus occurred. A curious case came under my care in the Cork Fever Hospital. The patient, a woman, aged thirty-four years, was admitted as suffering from fever. The unusual head symptoms caused me to suspect the accuracy of the diagnosis. There was no delirium, though the woman kept constantly rolling her head from side to side on the pillow, and complaining bitterly of violent pain in the occipital region, crying out occasionally with a shrill shriek, "My poor head ; my poor head !" She had peculiar seizures of the muscles of the right side of the face, closure of the eyelids, dragging of the mouth to the right side. Later on there were jerkings of the right extremities. On inquiry I found there was a history of an old catarrh of the left ear and discharge. The discharge had ceased of late, and the pain in the ear had been severe for three weeks before admission. The membrane was dry and there was a perforation in the posterior pocket ; there was no moisture or discharge. She died on the seventh day after admission to hospital. As I suspected, we found at the autopsy an abscess involving the right lateral hemisphere of the cerebellum, the peduncle, and crus ; the pus was fetid. There was no necrosis of the posterior surface of the petrous surface of the temporal bone, which was quite healthy. The tympanum was packed with dried pus ; the labyrinth was full of pus ; the membrane tympani was present, with a perforation about the size of the head of a pin.

Perforation of the Membrane. — In chronic suppurative catarrh, we recognise that frequent source of perforation which is so commonly presented to us in hospital practice. The patient complains of deafness and discharge ; there may or may not have been attendant pain. When we inquire into the cause, especially in children, we find that it is not easily ascertained. It may be attributed to cold or some feverish attack, or have supervened on one of the exanthemata. It may have been caused by the impaction of a foreign body or an injury. On

examining the ear there is often a quantity of yellowish discharge concealing the membrane from view; this is chiefly pus mixed with epithelium. Perhaps there are collections of fungus in the depressions on the walls of the meatus, on the membrane, or in the tympanum. After careful cleansing, we see the membrane in varying degrees of thickness and shades of colour, and perforated. These perforations are often large, and not uncommonly polypoid growths are detected growing from the tympanum through the perforation, or projecting from it. On examining the throat in these cases we may find an explanation of the ear trouble.

Catarrhal states of the nasal and nasopharyngeal mucous membranes, and follicular enlarged tonsils, are conditions that accompany Eustachian obstruction or closure.

A perforation, unless it present the form of a mere rent in the membrane, or a minute pin-hole, is easily seen, and if not seen, is discovered by means of the otoscope. A source of error to beginners is the bright bubble of air and liquid

which sometimes obscures the orifice. On throwing a good light on the membrane, and desiring the patient to close the nose and blow, the air will often be seen to bubble out through the aperture in the membrane.

Sometimes these acute perforations pulsate; this is due to the arterial throb. This pulsation may puzzle a beginner not accustomed to examine such perforations. As to the character of the perforation, this may vary in size from a small pin-hole or chink to a large ragged opening. One or all the bones may be destroyed or attached by adhesions to the tympanic walls. A mere rim of membrane may be all that is left, or even this may be absent.

Treatment.—In the plates taken from the "Aural Atlas" (see Plates I. and II.) are some representations of the various forms of perforation. It is remarkable the large number of patients who have extensive perforations yet retain remarkably good hearing power. The greater the number of cases we treat, the more are we astonished at the percentage of

patients whose hearing varies, say from $\frac{5}{100}$ to $\frac{10}{100}$ with the watch test, and whose conversational power is excellent. As noticed by Politzer, Wilde, and others, this hearing power does not appear to depend so much on the size of the perforation as the part implicated. It, of course, is more particularly influenced by any abnormality of the stapes if the bone be fixed by adhesions, ankylosis, &c., or indirectly affected through the direction of the perforation (Politzer), and the transmission of the sound-waves to this bone. This has to be remembered in the application of artificial membranes, the good effected being not so much attributable to closure of the opening by the disc or wool, as to properly-applied pressure on the stapes (see chapter on General Therapeutics, Artificial Membranes).

A very large proportion of those who apply for relief for perforation of the membrane are children, and this fact, which has been dwelt on of the neglect of chronic discharges in young persons, has to be remembered in relation to this inattention. More especially in the case of the child must we rely more on systematic attention and cleanliness in otorrhœal troubles than on all other measures combined (see chapter on General Therapeutics—Cleanliness). I think it of great advantage to wash out the tympanum occasionally through the perforation in the manner already described. This is easily done, and cleanses the Eustachian tube also of any secretions that may have passed or accumulated there. I have never, though it is a constant practice of mine, had any worse result from it than a temporary giddiness.

To successfully treat any aural case, the surgeon must always remember the cycle of causes which set in motion the actual train of symptoms from which a patient suffers. The disease may have its origin in the throat, nose, or pass to the Eustachian tube, and thence to the tympanum with its ossicles, involving the membrane, and lastly the external meatus; or the reverse of this order may mark the course of the disease. This must always be remembered in perforation. All through, on treating a case, we must not merely direct our efforts towards healing the membrane, we should also attend to all the passages, as, for example, any relaxed or congested state



FIG. 125.—Double Perforation with partition between.

1



5



2



6



3



7



4



8



PLATE I.

FIG. 1.—Polypus growing from roof of meatus (immediately in front of membrane, which was found to be entirely absent on the removal of the polypus), showing deceptive appearance of this polypus before the ear was cleared out, and a large flake of epithelium removed.

FIG. 2.—Membrane, drawn after removal of polypus and healing of perforation.

FIG. 3.—Membrane, with cretaceous deposits at each side of malleus.

FIG. 4.—Membrane in great part absent, sebaceous tumour in the cavity of the tympanum.

FIG. 5.—Mulberry mass, protruding in front of a perforation; some pus seen above; inflamed and fleshy membrane to the side.

FIG. 6.—Perforation after scarlatina, polypoid mass protruding from cavity of tympanum.

FIG. 7.—Old Eustachian case. Membrane very white, one large pocket blown out bladder-like on inflation.

FIG. 8.—Same ear (as shown in fig. 4) after removal of the tumour, with the lever ring forceps.

PLATE II.

FIG. 9.—Idiopathic perforation, no pain during occurrence, drawn when healing aperture ultimately completely closed.

FIG. 10.—Polypus in cavity of tympanum of insane patient, producing vertigo.

FIG. 11.—Extensive perforation of membrane—result of scarlatina.

(Drawings of this and fig. 13 inverted in the printing by error.)

FIG. 12.—Exostosis in meatus; small chink existing. This patient (a medical man) was subject to recurrent furunculus in the meatus.

FIG. 13.—Membrane with large central perforation, drawn when healing, and after treatment by absolute alcohol and glycerine applications.

FIG. 14.—Membrane as seen altered on removal of the coating shown in next figure.

FIG. 15.—Peculiar appearances presented by a membrane covered with epithelium and oily deposit. On removal of a large scale of this amalgam, this membrane presented the appearance seen in fig. 14. Patient for some time dropping oil into the ear.

FIG. 16.—Exostosis; some purulent matter blocking up the chink.—Other ear of patient fig. 12.

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14



11



15



12



16



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4

of the mucous membrane of the pharynx, enlarged tonsils, and to the naso-pharyngeal mucous membrane. If the throat and naso-pharynx be engaged, they must be dealt with according to the condition present (see Throat and Naso-Pharynx). If the Eustachian tube is closed or obstructed it must be attended to, catheterised, and washed out with warm alkaline solutions. If the tonsils are enlarged they should be removed, and the same remark applies to adenoid growths. The tympanum should be freed of any accumulated secretions. Politzer's air douche is indispensable, and should occasionally be used after the tympanum is cleansed.

When we come to deal with the perforation itself, the first essential is perfect cleanliness, by washing out all discharge from the tympanum and meatus. In syringing through the tympanum and Eustachian tube I generally select a solution of chloride of zinc, chloride of ammonia, or sulpho-carbolate of zinc (gr. ij. to gr. iv. to the ounce), with a little glycerine or carbolic acid (1 per cent.) I always first pass a stream of warm water through the nose, and then the astringent or disinfectant solution. In fact, in all syringing of the ear, whether by the patient or the surgeon, warm water should first be used, so as to clear out all old discharge before employing a medicated solution. The healing of the perforation, which is generally a tedious process, is best affected by repeated topical applications of various stimulating and astringent powders and solutions. Talc powder, boracic acid (impalpable powder), tannic acid, salicylic acid, nitrate of silver, chloride of zinc, sulphate of zinc, absolute alcohol and glycerine, carbolic acid and glycerine, aldehyde, with carbolic acid, are some of those most frequently used with success. I prefer of late the saturated solution of boracic acid, with equal parts of absolute alcohol and glycerine, as a final application after the perforation has been carefully dried. Having cleansed out the meatus and perforation well, the latter should be thoroughly dried with cotton-wool rolled on the aural probe, and then with this same probe the nitrate of silver or other solution carried well down to the perforation, and its margin touched. I always use the air douche of Politzer a few times

after the employment of any of these agents. If powder be used it must be very gently blown with a fine tube, and quite on to the surface of the membrane, and care must be taken that it is washed out every third day before it is again applied. I rarely myself use powders. I prefer concentrated solutions. There is a strong objection to give patients powders to use themselves in cases of discharge from the ear. They cannot sufficiently cleanse the meatus when using them, and the powder is apt to cake both on the membrane and in the tympanum if there be a large perforation. This I have several times seen.

Iodoform,¹ its odour being disguised by powdered coffee, vaniline, or coumarine, is the most invaluable remedy in otorrhœal discharges. It should be prescribed in all cases (see Formulae.) I now commonly use iodoform for cleansing the meatus in this manner. The iodoform saline is applied with a camel's hair pencil, or a little of it is smeared on a piece of cotton-wool and inserted into the meatus after it has been cleansed at night with a sulpho-carbolate of zinc and chloride of ammonia wash. This is repeated in the morning, and the iodoform salve again used. In many of these cases I find nitrate of silver (10 to 20 grains to the ounce) the most efficacious remedy for healing perforations. I know no better lotion for the patient's own use than that of sulpho-carbolate of zinc and glycerine with carbolic or boracic acid. However, these remedies, and others such as alum and chloride of ammonia (I think it may be taken as a general rule that the most convenient strength of these various astringent washes should be about 5 grains to the ounce), must be alternated and varied in the treatment of perforation, the secret of treating it successfully being constant attention and cleanliness on the part of the patient, combined with the application, almost daily by the surgeon himself, of the more powerful remedies. With reference to the application of artificial membranes, I

¹ To Dr Robert Sinclair of Dundee in the United Kingdom the credit is due of drawing special attention to the value of iodoform in aural practice; and to Drs Lizarda and Rossetti abroad. Last year, in the *Provincial Medical Journal*, I suggested the use of iodol instead of iodoform in these cases. It has no unpleasant odour. It answers well, but I doubt its equivalent antiseptic strength.

have previously described the different forms of these, and the best mode of their application.¹

TENOTOMY OF THE TENSOR TYMPANI.

In the second edition of this book I fully described the steps of this operation as performed by Weber-Liel, Hyrtl, Hartmann, Urbantschitsch, and others. I purposely omit in this work entering into these details; as, however, the practitioner may be consulted in some cases on the propriety of submitting to this operation, I reproduce the summary of the indications for the therapeutical effects of the operation. According to Weber-Liel, at the time this was written he had operated over 500 times on the living subject. It is an operation which has found more favour on the Continent than in this country, and has been most favourably reported on by Urbantschitsch (Vienna), Miot of Paris, Gruber, Politzer, and others. It is especially in those cases of obstinate tinnitus and deafness, in which other remedies have failed to afford relief, that this operation is to be considered. These are the indications for the operation, and its therapeutical effects, according to Weber-Liel:—

“First, By means of the operation and the subsequent treatment by the air douche—the koniontron, used to prevent reunion of the tendon, we are enabled in a large percentage of cases, in so-called nervous ear disease, to afford relief and arrest its progress.

“Secondly, Tinnitus either entirely disappears or is greatly modified. It appears that there is a pretty constant relation between the tinnitus and the character of the deafness, as the difficulty of relieving the latter may be decided by the influence the operation exerts on the noises.”

Dr Weber-Liel thus further classifies the cases in which tenotomy is indicated:—

(1.) Those in which the deafness is not far advanced, and the patient can hear when spoken to directly into the ear.

(2.) Those in which deafness is associated with tinnitus.

(3.) If the examination of the membrane makes it improbable that there are

adhesions in the zone of the tensor muscle or a retraction or contraction of it.

(4.) When suction or rarefaction produces slight temporary benefit, and diminution in the noises and the deafness.

(5.) Those cases of “progressive disturbances” of hearing accompanied by subjective phenomena “with and without additional symptoms of dizziness,” or tinnitus aurium, and where all other therapeutic means had failed.

(6.) Those cases in which objective symptoms such as contraction of the membrana tympani: fixation and retraction of the malleus, and where “the anterior portion of the membrana tympani stands back from the sharply projecting edge of the handle of the malleus and is immovable.” In these cases the state of tympanal and intra-auricular hypertension before referred to exists, and that in removing the tension caused by the retraction of the tendon of the tensor tympani, we at least remove one factor, and that a powerful one, which increases the pressure on the labyrinth.

The most favourable cases for tenotomy would be such as are only partially relieved by the air douche, and in which a temporary but not a permanent improvement was effected.

Dr Weber-Liel refers to the operations of Kessel for removal of the ossicles, or even the membrana tympani in its entirety, and section of the stapedius as being consequent upon his operation of tenotomy of the tensor tympani.

The symptoms of megrim, giddiness, &c., which are common attendants on this class of case, disappear frequently the day after the operation.

The good effects of the operation appear to be in proportion to the duration of the symptoms, nor does there appear to be any certain indication of its success. But Dr Weber-Liel asserts that though it may be thus unsuccessful in the operated ear, the other ear which is not interfered with is materially benefitted, and even hearing power restored completely, and likewise the noises disappear in it.

Secretion of cerumen is promoted, and returns where it has been absent; attacks of megrim and other disturbances which have been attendant on the aural trouble cease.

¹ See page 68.

Dr Paquet of Lille proposed an operation which he had found successful, a combination of that of Weber-Liel's, in which there is section of the reflected tendon of the tensor tympani muscle, and of that in which an incision, with or without excision of a portion of the membrane, is practised. This incision is V-shaped, dividing not only the membrane but also the reflecting tendon of the tensor muscle. The perforation is

rendered durable by excising a portion of the lower end of the V-shaped curtain (see *Proceedings of the International Medical Congress*, 1881).

It is only right to add that several authorities, as for instance Schwartze, Hartmann, and others, attribute the good effects derived from tenotomy rather to the incision of the membrane or resulting perforation than to the section of the tensor tendon.

CHAPTER XVI.

SOME AFFECTIONS OF THE MIDDLE EAR—*continued.*

MASTOID INFLAMMATION AND ABSCESS—OPENING OF THE MASTOID PROCESS.

MASTOID INFLAMMATION AND ABSCESS.

Causes.—In acute and chronic otitis externa, and in catarrhal states of the tympanum, the inflammation may spread to the mastoid cells and to the brain. The cerebrum and cerebellum may be attacked, more frequently the latter, if the case be that of an adult. The lateral sinus may be involved, phlebitis, thrombosis, or septicæmia following. The more frequent causes that give rise to inflammation and abscess of the mastoid process are the exanthemata, injuries, abscesses in the meatus, suppurative catarrh in the tympanum, polypi, and the strumous diathesis. These, both in children and adults, may lead to abscess in the mastoid or mastoid periostitis.

Symptoms.—Mastoid periostitis is marked by characteristic symptoms. There are frequently severe constitutional accompaniments, such as rigors, rapid coating of the tongue, quick pulse, increase of temperature, with severe pain. The post-auricular and supra-auricular regions become red and swollen. The rapidity with which the swelling occurs is often alarming. In a case under my care of severe furunculous inflammation in the meatus, the entire side of the face and neck became swollen in forty-eight hours. The swelling has then an erysipelatous look. I have never seen a case of mastoid periostitis or abscess in which the meatus and tympanum have not been involved. The sterno-mastoid has only been impli-

cated in one case. Turnbull notices that implication of the sterno-mastoid is not probable when the inflammation is intense; we are more likely to have caries and post-aural opening. If the inflammation runs its course, suppuration may occur, and the pus will escape either by the external meatus or through the mastoid process. Remembering the anatomy of the bony parts (see Mastoid Process in chapter on General Anatomy), it must be a matter for surprise that the mastoid cells escape as frequently as they do, when the tympanum is affected. still there can be little doubt that the spreading of the inflammation does frequently happen, and is not suspected. Purulent or hyperplastic formations may occur in the mastoid cells, especially in children, and no external evidence exists of this. It is surprising how often in children, especially of the poorer classes, extensive bone changes may go on in the mastoid, leading to softening, necrosis, and caries, with but little indication of the danger, and consequently a degree of excusable neglect on the part of the parents.

Dr Orne Green (*Proceedings of the Otological Society of New York*, 1877), divided the results of periostitis in the interior of the mastoid cells, thus:—(1) *Formation of pus and resulting abscess*; (2) *Extension of the inflammation by the minute vessels in the osseous foramina to the external surface of the mastoid*; (3) *Ostitis*—this latter being purulent or hyperplastic—purulent, leading to per-

foration, with consequent absorption of the entire osseous structure or of the calcareous particles alone, or, it may be, to complete necrosis or caries; hyperplastic, causing new periosteal bony formation, and resulting hyperostosis, and perhaps finally obliteration of the entire mastoid cavities by new bone.

Course and Termination.—Properly directed treatment will generally arrest ordinary inflammation of the periosteum of the mastoid, the swelling, redness, and pain subsiding after some days. This work applies however to those cases in which there have not been extensive middle ear inflammation, effusions, or collections of pus in the tympanic cavity, for here we are more likely to have caries and necrosis of the bone and concealment of pus in the cells and antrum. It is very different in these latter cases.

To illustrate how nature indicates the course of action the surgeon should pursue in these suppurative cases, I may cite the following instances of escape of bone through the external meatus, with relief of brain symptoms:—

In 1875, a child, aged four years, was brought to me with the following history:—He had been quite healthy up to a few months since, when pain in the ear and discharge began. Subsequently an abscess formed over the mastoid process. The child had two or three attacks of convulsions. On examining the ear, I found the post-auricular surface soft and swollen, the meatus full of purulent and foul-smelling discharge. I cleaned the canal well out, and was surprised to find the meatus filled with a piece of loose and dead bone. This I removed, incised freely the mastoid process, kept the incision plugged with iodised wool, and cleansed with carbolic lotion daily, washing out the meatus with the same. The child made a good recovery, but with loss of hearing.

In April 1880 a young lady consulted me. The right mastoid process was completely absent, a large hollow existing. This had occurred when she was a child, and was the result of mastoid abscess, yet she had fair hearing power in the corresponding ear.

In 1881, a child, aged eighteen months, was brought to the hospital with large apertures in both the mastoid processes. I freely incised the bone at either side,

and almost the entire of the right mastoid process came away at the time, being removed easily with the forceps. Some time afterwards she came to hospital in my absence from home; the other mastoid process had meanwhile softened, and was now removed. The child was otherwise quite healthy. The external meatus was syringed freely with a disinfectant solution, such as chloride of zinc, Condy's or carbolic acid, the fluid running out through the aperture in the mastoid. The parts completely healed, and the child was brought by the mother to consult me about the hearing, which was completely lost.

Early in 1881 a pale, anaemic-looking child, aged twelve months, was brought to the hospital with ptosis of the right eyelid, dilated pupil of the same eye, and the vision apparently lost. There was a considerable swelling of the entire left aural region. The mastoid was very much inflamed, soft, red, and swollen; the auricle was projecting, this projection or displacement of the auricle being a pretty constant symptom in such cases. Altogether the child had a most peculiar appearance. There issued from the meatus a foul and long-neglected discharge. The skin behind the auricle was perforated in two or three places, and the bone was evidently dead underneath.

The ear of the patient is represented in the drawing. I determined to make a free incision into the mastoid, which I

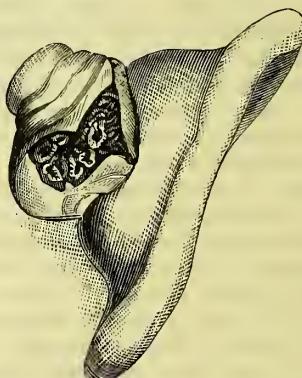


FIG. 126.—Necrosis resulting from Mastoid Periostitis.

did, and though, at the time, there was very formidable venous haemorrhage, this was readily controlled with a plug and compress. The ear was daily washed

out with chloride of zinc injections, and the mastoid dressed with carbolised wool saturated with chloride of zinc solution. Under this treatment the child did well, but the ptosis and strabismus remained. With the ophthalmoscope there was but little evidence of any abnormality, the only thing apparent being a hyperæmic state of the papilla. Lately this child came to the hospital when I was absent on my holiday trip, and a long piece of the mastoid process came away, the wound being treated as before.

Dr Huntington Richards has reported an interesting case of mastoid disease, which illustrates so many points connected with suppuration of the mastoid process, that I include the following brief outline of it:—In August 1886 “the patient was seen by Dr Albert H. Buck, who found slight prolapse of the upper wall of the external auditory canal, the membrana tympani red and swollen, but not markedly bulging, and having a small perforation. The patient complained of throbbing in the ear, and stated that he had suffered from intermittent otalgia. The treatment of the case was committed to Dr Richards by Dr Buck, who advised immediate paracentesis of the drum-membrane and a Wilde's incision, with poulticing and frequent use of the Angelo douche, as a means of obviating, if possible, the necessity for drilling the mastoid process. Accordingly, on the afternoon of this same day Dr Richards visited the patient at his residence, freely incised the drum-membrane, made an incision through skin and periosteum over the mastoid process, and ordered poultices to be applied over the mastoid region, and the frequent use of the Angelo douche. On the following day no change in the appearance of the auditory canal or membrane was noticed. The discharge, consisting of thick pus, was abundant.” Antiseptic douching was continued for some days, while pain, swelling of the auditory canal, and bulging of the membrane with discharge continued. Dr Richards again incised the membrane and counter-irritated the mastoid with solid nitrate of silver. The Eustachian tube being pervious he practised inflation by Politzer's method, directing the patient to inflate by Val-salva's plan. The previous incision not being sufficient he re-incised the membrane with a free incision upwards and

backwards to its margin. Another mastoid abscess formed, communicating with the drum-cavity, which was shown by the escape of pus at the external meatus on pressure over the mastoid. This was also opened freely, both blood and pus escaping from the depth of $1\frac{1}{2}$ inch from the surface. Severe haemorrhage accompanied this incision; the wound was stuffed to control this. Discharge from the ear ceased. Some days subsequently the patient “complained of nausea, and suffered from headache, referred to the supra-orbital and occipital regions. Temperature $100^{\circ}4$ F., pulse 68. There was a slight discharge of pus from the wound, and the lint pedgelet was easily extracted. The depth of the wound down to the bone was half an inch. After prolonged probing an opening into the bone was detected under the extreme upper angle of the wound, and into this opening the probe was introduced to the depth of an additional half inch, its point touching what appeared to be the margins of fine bony lamellæ—none of them loose. Into this bone-channel Dr Richards introduced a small silver cannula, and through it syringed out the sinus and wound with a weak solution of bichloride of mercury. No return current came through the auditory canal, but some of the fluid escaped by the *nostrils*, and was distinctly felt by the patient as it passed through the cavity of the tympanum. “Immediately afterward,” says Dr Richards, “I tested the hearing, and found that my watch, which before had been heard no further than half an inch, could now be heard distinctly when held at a distance from the ear of $4\frac{1}{2}$ inches. A small drainage-tube was inserted in the bony sinus, its outer extremity being stitched to the lips of the wound, and an anti-septic dressing was applied. The exact location of the sinus in the bone, as ascertained by careful measurements, was $1\frac{1}{2}$ inch back of the posterior margin of the meatus auditorius, and on a level with the upper margin of the latter; its direction was at right angles to a plane tangential to the skull at the point indicated. By comparison with the opposite side of the patient's head, this point would appear to correspond pretty closely to the opening of the mastoid foramen leading into the lateral

sinus. The bone sinus into which I had introduced a probe and drainage-tube, and through which I had syringed, may have been the mastoid foramen enlarged by pathological breaking down of its walls, or it may have been a gap similarly formed in the masto-occipital suture. However this may have been, it is pretty evident that the cancellous tissue of the patient's mastoid was largely developed, and that it extended unusually far in a posterior direction." On September 16, he "found the patient quite free from headache, with returning appetite, and a temperature of only 99°.1 F. The drainage-tube was removed and a carbolised horse-hair drain substituted. Two days later the hearing distance had increased to 15 inches, and four days later (September 20) it had increased to 16 inches. On September 23 he removed the horse-hair drain and omitted further dressing of the wound; and when he last saw the patient, September 29, the wound had entirely healed. From this out there was an uninterrupted recovery.¹

Treatment of Mastoid Inflammation and Abscess.—In the instance of mastoid periostitis the earlier symptoms may be met by free leeching over the mastoid process, the application of the artificial leech, the application of Leiter's refrigerating tube (see General Therapeutics, page 84), or, failing it, a small ice bag suspended on the affected bone, its effects being carefully watched, or iced compresses. The meatus and tympanum must be well attended to, both being kept pervious. If we fear accumulation in the tympanic cavity, warm douches should be used with the Eustachian catheter. If fomentations are more agreeable to the patient and relieve the pain, they should be resorted to. Poultices, it should be borne in mind, when constantly applied tend to increase the general hyperæmia and congestion.

Salines should be administered and the pain at night relieved by hypnotics. My experience is altogether in favour of incision in those cases in which after some days the symptoms continue, notwithstanding this treatment. When the swelling does not subside and encroaches on the auricle, whether there be pus present or not, the incision of Wilde gives great relief. The best position for the

incision is immediately (1 centimeter) behind the auricle, this line answering subsequently for the application of the trephine if it be necessary to use it. After incision, the probe should be used and the periosteum above examined. Its state will afford an indication of deeper mischief in the cells or the probability of purulent collections, and also of the presence of any necrosed bone. I can recall several instances in adults, in whom free incision over the mastoid, when there were signs of periostitis, has been followed by the happiest results—complete subsidence of the pain and inflammation, and in one case in which the most alarming symptoms—delirium, high fever, vomiting, &c.—were present, this step gave almost immediate relief, the rapid subsidence of the swelling in less than twenty-four hours after the free evacuation of the concealed pus eliciting exclamations of surprise from the students present, who had seen the patient on the previous day. In children, incision down to and through the bone is the thing indicated when there are evidences of extensive periostitis or purulent formations.

OPENING OF THE MASTOID PROCESS.

It is necessary to emphasise the vital importance of this step in certain cases of ear disease, and the responsibility resting on the surgeon who omits to carry it out, in the event of a fatal issue following when the operation is not performed. On a few occasions I have in vain urged the propriety of making an experimental perforation of the mastoid process by the trephine when urgent brain complications were present, and the fear of the operation and its direct results prevented this step being taken. In two instances I can only regret that it was not performed, as death from brain trouble ensued, and the refusal of an autopsy prevented my ascertaining the cause of the fatal termination of the case. Burnett, who gives the point of choice for perforation about a quarter of an inch behind the external auditory meatus, a little below the level of the upper wall of the canal, thus eloquently refers to such cases:—"And yet men have been allowed to die with no better effort to their rescue than a poultice bound over the bony cavity in which lay the cause of their dissolution."

"It is," says Hinton, in giving as the best point of selection a spot level with the upper border of the meatus, and about half an inch beyond it, "of the utmost importance not to delay too long, and since the ether spray will generally suffice to deaden the pain, incision of the mastoid may be had recourse to promptly in every such doubtful case. I may repeat that I have never regretted making the incision, and scarcely ever decided against making it without regretting that I did not;" and he goes on to say that "the most scrupulous care should be given to detect any symptoms of the presence of matter pent up under the periosteum. This is generally found in one of two places—either over the mastoid process externally, or within the meatus at the posterior and upper wall. Any redness or swelling, with tenderness of these parts, should prompt immediate action."

Politzer (*op. cit.*, p. 564) classifies under five heads the indications for the operation :—(a) Purulent inflammation, with persistent pain unsubdued by other means; (b) accumulation of pus in the mastoid process when there is no means of escape by the external meatus, even when the parts over the mastoid are not swollen or infiltrated; (c) when symptoms indicate retention of pus in the mastoid process though the posterior wall of the meatus have been incised; (d) in cases in which we have reason to fear the existence of a circumscribed osseous abscess; (e) "as a vital indication in any suppuration, combined with inflammation of the mastoid process in which vertigo and headache are developed during the course of the affection in such cases the indications for the operation is vital."

To perform the operation the surgeon requires a good light; an anaesthetic; sponges; carbolised water; torsion forceps; a few small retractors, or hooks; a strong blunt-pointed knife; a trephine or gouge, like that of Hinton, shown in the drawing; a few small sized and differently shaped Volkman's spoons. A curved incision is made perpendicularly down to the bone in the situation before described, and about an inch and a half in length, avoiding the external meatus but keeping sufficiently far in front to avoid the venous sinus, directing the

point of the knife in a direction towards the auditory canal. A small flap incision may be made if the operator prefers, so as to expose a greater surface of periosteum. Vessels are twisted and a little time is taken to control the haemorrhage, for which purpose very hot water and a sponge may be used. The periosteum if remaining is peeled off, and the bone is now most cautiously operated on in the method the operator elects, whether with chisel and small mallet, the

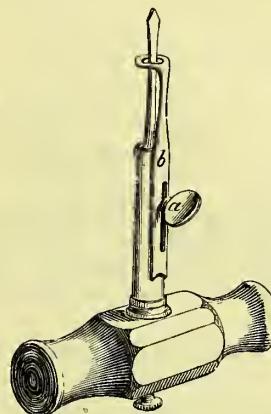


FIG. 127.—Hinton's Trephine for opening the Mastoid Process.

trephine, or Volkman's spoon. The extent of the aperture in the bone, its depth, and other features of the operation, will depend in great measure on the amount and character of the disease, and on the formation of the mastoid process itself. There should be no haste, and from first to last excessive care be taken both in searching for the wall of the venous sinus, and in avoiding it.¹ The chisel is more suitable for those cases in which the osseous structures are not softened, the sharp spoon for caries.

"In my operations," says Hartmann, "I have followed the maxim of confining myself in the removal of the morbid parts to what was most needed, *i.e.*, chiefly the removal of the granulations and the extraction of such sequestra as were fully loosened and could easily be reached. It seems then necessary in the after treatment to keep the wound open

¹ "On the Formation of Sequestra in the Mastoid Process of the Child," by Dr Arthur Hartmann of Berlin, translated by Dr James A. Spalding, *Arch. Otology*, vol. viii. No. 1. New York, 1879.

by a thick drainage-tube, so that in the subsequent days we may have a full view into the depths of the wound, from which now the sequestra, gradually loosening themselves, may be detached with the probe and removed. It seems also desirable in the latter stage (as has been emphasised especially by Schwartz and v. Tröltsch) to keep the aperture open as long as possible by means of a leaden nail or a short leaden tube, until we are

sure that the mastoid process is in a sound condition. The important point in the after treatment is the regular removal of the accumulated secretion, for which purpose we prefer syringing at first with antiseptic, later with neutral, and lastly with astringent fluids." In all cases the formidable and serious nature of the operation and its risks should be plainly placed before the patient and relatives.

CHAPTER XVII.

SOME AFFECTIONS OF THE INTERNAL EAR.

TINNITUS AURIUM AND GIDDINESS (AURAL VERTIGO)—CAUSATION—DIAGNOSIS—CHARACTER OF—AURAL HALLUCINATIONS, VARIOUS FORMS OF—PROGNOSIS—AURAL VERTIGO—OCULAR VERTIGO—CAUSES OF AURAL VERTIGO—WOAKES ON—MÉNIÈRE'S DISEASE—GUYE ON—ECKERT ON—POLITZER ON—CHARCOT'S LARYNGEAL VERTIGO.

TINNITUS AURIUM AND GIDDINESS (AURAL VERTIGO).

Causation.—Tinnitus Aurium is a symptom for which we are frequently consulted, and which springs from such a variety of conditions that it touches almost every conceivable morbid state (as may be seen by the table I have summarised of its causation) to be found either in the external, middle, or internal ear. The effort to relieve it involves an acquaintance with the simplest abnormal states, as it does with the most intricate complications to be found in the entire auditory tract.

Tinnitus is often the most unsatisfactory symptom that we have to deal with in the subsequent management of an aural case. And in relation to our prognosis we may safely say that it renders a large proportion of patients less amenable to treatment, and points to graver mischief than that which we can combat with local or general remedies. Weber-Liel divided chronic affections of the ear into two great groups, those in which tinnitus was present and those in which it was absent. In the former there is a tendency to progressive deafness. This statement applies more particularly to that tinnitus which is due to non-inflammatory changes in the middle ear, or

abnormal conditions of equilibration in the labyrinth. Such conditions we may group under four heads—*primary*, having their origin in intra-labyrinthine changes, such as hyperæmia, apoplexies, atrophies and paralysis of the nerve, new growths, the results of suppuration, syphilis; *secondary*, due to morbid states of the middle ear, producing, through altered mobility in the ossicles and especially the stapes, pressure on the fenestra, increase of tension in the labyrinthine fluid, and pressure on the basilar membrane and the elements of Corti. Such alterations in the conditions of equilibration and the correlative functional changes in the vibrating media of the middle ear and labyrinth, which are essential for the transmission of sound-waves, are quite independent of the next group; *thirdly*, disturbances which have their source in certain cerebral and cerebro-spinal changes, and which latter in two different methods affect the organ of hearing, either by (1) the spread of disease directly to the labyrinth through the auditory nerve, or (2) by pressure, thus indirectly bringing about similar functional effects, as in the case of cerebral tumours, encephalitis, spinal arachnitis, hydrocephalus; *fourthly*, reflex disturbances, which arise from remote organic or functional affections, whether

in brain, spinal cord, stomach, heart, kidney, or uterus, and which are associated with noises in the ear; while there is, at least for a considerable time, no corresponding structural deviation in the middle or internal ear.

Persistent tinnitus we may look on, in a large proportion of cases, as indicative of some permanent change in the auditory structures, and in the vascular or nervous supplies. Not infrequently these vascular departures from the normal state are the consequences of disease in some of the viscera, more frequently the heart or kidney. The undulatory disturbances in the vibrating media may start from the fluid in the labyrinth, the blood in the vessels, the air in the tympanic cavities, the air in the meatus; while we may relatively trace the altered pressure or tension to such causes as increase in the cerebro-spinal fluid or displacement of it, atheromatous degeneration in the auditory vessels, cardiac disease with its corresponding change of vascular tension, disease of the osseous structure in the petrous portion of the temporal bone, relaxed states or increased tension of the tubal or intra-tympanic muscles, adhesions in the tympanic cavities, ankyloses of the ossicles, or limited mobility in the articulations, nucleus in the tympanum, rigidity, collapse, or displacement of the membrana tympani, perforation, the presence of any foreign substance in the external meatus, or encroachment on the lumen of the canal from a growth or inflammation.

We might thus tabulate the pathological causes of tinnitus:—

EXTERNAL EAR:—

- Inflammation.
- Cerumen and collection of epidermis.
- Polypi.
- Exostosis.
- Othoëmatoma.
- Foreign bodies.

MIDDLE EAR:—

Alterations in the shape, position, consistency, mobility and integrity of the membrana tympani—adhesions.

Ossicular changes, adhesions, ankyloses, rigidity, displacements.

Thickening of the mucous membrane. Inspissated collections of mucus, pus, aspergillum.

Fluid exudations.

Small tumours.

Spasm and variation in tension of the tympanic muscles.

Relaxation and enervation of the muscles of the soft palate and Eustachian tube.

Collapse or closure of the Eustachian tube.

Atheromatous degeneration of the arteries and aneurismal dilatations.

Blood extravasations (Ménière's disease).

Increased or diminished tension in the arteries (including the action of drugs on the tension of the vessels of the tympanic membrane and drum cavity).

Venous congestion and fulness within the lateral, petrosal, and transverse sinuses.

Disease of the mastoid cells.

Disease of the petrous portion of the temporal bone.

INTERNAL EAR:—

(1) *Increase of labyrinthine pressure* (principally arising from two causes—(a) increase of fluid, (b) rigidity of, or pressure on, either of the fenestrae).

(2) *Vascular changes*, general increase of blood-pressure or diminution, frequently associated with cardiac disease and morbid or irritable blood states (anaëmic or toxæmic); anaëmia of the labyrinth or hyperæmia (the result frequently of mental shock, over-work, or worry), apoplexies, extravasations.

(3) *Nerve changes*, (a) hyperesthesia, pareses (organic or functional), atrophies, scleroses, traumatisms.

(4) *Rheumatic, gouty, syphilitic affections*.

(5) *Reflex disturbances*, in various uterine disorders, pregnancy, gastric derangement, dyspepsia, hepatic derangement, hysteria, spinal neuroses.

(6) *Cerebral and Cerebro-spinal affections*, tumours, secondary degenerative changes, apoplexies, effusions, thrombi.

(7) *Therapeutical*, i.e., the action of such drugs as nitro-glycerine, alcohol, ether, quinine, salicine, santonine, caffeine, apomorphine,

nitrite of amył, tobacco, iodine, iodoform, chloride of barium, digitalis, convallaria, atropine, veratrine, duboisine, gelseminine, jaborandi, monobromide of camphor, hydrobromic acid.

(In quinine intoxication I have known giddiness, hallucination, vomiting follow the tinnitus. I have elsewhere quoted the case of a military officer who had to undergo a court-martial for the active effects of a large dose of quinine when he was on parade. In a case also previously cited by me, I am afraid I induced symptoms of Ménière's affection through the action of the alkaloid quinia.)

I have already referred (Chapter V.) to the special anatomical facts in connection with the vascular and nervous supplies of the labyrinth, all of which have an important bearing on the varieties and treatment of tinnitus. Side by side with these anatomical data we may group the physiological and pathological causes of subjective tinnitus:—

1. Interferences with the sound-conducting media in the external and middle ear, viz., the air in the meatus, the membrana tympani, the ossicles and ligaments of the tympanum, the air of the cavity of the tympanum, the fenestræ, the air in the Eustachian tube.

(I have had a patient in whom troublesome tinnitus has been produced by snuff which had entered the Eustachian tube and the cavity of the tympanum, the tinnitus being removed on washing out the cavity of the tympanum and clearing the tube.)

2. Interferences with the fluid in the labyrinth.

3. Interferences with the action of the intra-tympanic muscles, or the tubal muscles (increase of tension, rigidity, or relaxation).

4. Reflex disturbances—

(a) Transmitted to the auditory nerve terminations.

(b) Transmitted to the muscles of the tympanum, soft palate, and Eustachian tube.

(c) Transmitted to the auditory nerve nuclei.

5. Impulses originated or reflected by the auditory nuclei, the cerebellum, or the hearing centre, and referred to various situations, as the ear or different parts of the head.

6. Irritation in any portion of the auditory nerve tract direct or reflected.

7. Inhibition.

8. Vascular changes, causing alteration of blood pressure or morbid blood supply—

(a) Vaso-motor irritation or paralysis.

(b) Cardiac diseases.

(c) Disorders of the blood, as chæmia, uræmia, anaæmia, menstrual irregularities, the vascular changes of pregnancy.

(d) Atheromatous arteries.

(e) Thrombus or embolus.

9. Hallucinations, the consequence of perverted mental action.

With such an analysis as this before us it is not difficult to realise how the pathological conditions already referred to tend to produce perverted function and disturbance, whether central or peripheral, in the auditory sensations.

Diagnosis.—Our duty is to differentiate those clinical and pathological causes which are removable and amenable to treatment from those which are outside the physician's art. Yet in this effort lies the first difficulty which meets the aurist. Simple enough in the case of the affections of the external ear, it becomes more difficult when we approach the middle, and still more so when we have to deal with the internal ear or morbid states of the cerebrum or cerebellum. A glance with the *speculum* will show some abnormality of the external meatus which may account for the tinnitus; this will also demonstrate alterations in the membrana tympani, dullness, rigidity, thickening, thinning, adhesions, bulging, undue prominence of the malleus, and, by the practice of Valsalva's inflation, the degree of mobility. The *otoscope* will define for us the patency or otherwise of the Eustachian tube, and a little practice and experience will as clearly enable us to differentiate the various responses of the drum-head to the inflated air as we educate it to appreciate the changes in the murmurs of respiration conveyed to the ear with the stethoscope. The *tuning-fork* enables us, in the great majority of cases, to decide how far the nerve is implicated by the middle ear changes, if these be present, or if not, the degree to which the impairment of the nerve has extended,

and the power of transmitting sensations is retained, as it also assists us in separating purely middle-ear affections from those having their origin in the auditory sense apparatus in the labyrinth. *Politzer's inflation* tells us how far temporary restoration of equilibrium in the tympanum, through forcible inflation of air and the consequent effect on the pressure in the labyrinth, removes the symptoms and assists us in establishing the cause of their presence; the Eustachian catheter further confirms this test. Beyond this, in our first effort to determine the source of the tinnitus, examination of the ear does not in a considerable proportion of cases avail us much in defining and localising its origin. It indicates local conditions and proves local lesions. In other instances these may exist without any subjective phenomena. It is possible that the disturbing cause may lie outside these. The nature of the noises does not assist us much. In my notes I find a great variety of sounds, more commonly those resembling "kettle singing," "trees rustling," "whistling," "birds chirping or singing," "bells ringing," "water rushing," "the noise of a railway engine in letting off steam," "of the waves," "distant voices," "knocking," "rumbling of carriages," "hammering," "rain falling," "dog barking," "a shell before the ear," "bees swarming," &c.

As regards the character of tinnitus, I do not find that this, as a rule, makes much practical difference. Habits and occupation may influence this, as, for instance, in persons who are subject to constant noises, as telegraph operatives, boiler makers, or workers in machinery. I have usually found that the milder and more removable symptoms are described as a "buzzing" or "singing," such as when cerumen is present, or a foreign body in the meatus. A "drumming" in the ear I have noticed frequently, with temporary closure of the Eustachian tube. In a gentleman suffering with old tympanic mischief, and nervine impairment, the chief thing complained of was that occasionally he heard persons addressing him, causing him to turn round to ascertain who was speaking to him. I think that the louder the noise and the more defined its character, the more likely are we to find proofs of internal ear trouble.

Patients have many times assured me that only with difficulty could they realise the fact that persons were not speaking to them, that some musical instrument was not playing, that it was not raining heavily, or that a storm was not raging. And these noises were not connected with any other mental symptoms or hallucinations.

In a reply to my interrogation as to his experience of the occurrence of tinnitus and hallucinations in the insane, on which subject he is so well qualified to give an opinion, Dr Ringrose Atkins, Resident Medical Superintendent of the Waterford Asylum, says:—“(1) Subjective tinnitus is rarely a special accompaniment of insanity, unless in those cases where the mental disturbance is consequent on epilepsy. In even the mildest forms of epilepsy, the ‘fits’ are very frequently preceded and ushered in by subjective auditory auræ, these auditory sensorial phenomena differing in a very large proportion of cases from the tinnitus common to certain diseases of the auditory apparatus, in their greater elaboration; for instance, a patient suffering from the tinnitus of aural disease, will hear ‘roaring,’ ‘buzzing,’ ‘whizzing’ or perhaps ‘whistling’ sounds, which may possibly be referred to the head, while the epileptic will suddenly and paroxysmally hear the sound of ‘bells,’ or ‘music,’ which may be accompanied by visual sensorial phenomena, and be immediately followed by loss of consciousness and convulsions. In cases of insanity, uncomplicated with epilepsy, it is frequently difficult to detect the presence of such subjective phenomena, and when they do occur they most frequently form the basis of true hallucinations, being then *psycho-sensorial* in character, the morbid sensorial phenomena being misinterpreted by the disordered mind. I have at present a female patient under my care, labouring under a mild form of insanity without epilepsy, who constantly complains of hearing bells ringing in her ears, but who is at the same time perfectly conscious of their unreal nature, and in whom therefore no hallucination exists. In my opinion, the more elaborated the auditory sensorial phenomena are in any given case, and the more constant in character, the greater the probability of the existence of a

central lesion in, or in the neighbourhood of, the superior temporo-sphenoidal convolution.

"It is quite possible that persistent auditory subjective tinnitus may be an exciting cause of true insanity; some years since I had under observation for some time an elderly man suffering from 'crackling' noises referred to the scalp, which were so intense and so distressing that he had to relinquish his business, and finally appeared, when he passed from my observation, to be drifting into a condition of melancholia. I apprehend that such sensorial disturbances lead to actual mental derangement, much in the same way as *paralysis agitans*, for instance, leads to melancholia.

"(2) Auditory hallucinations are a very frequent accompaniment of insanity, occurring more frequently than hallucinations of sight, and much more so than those of taste and smell. As regards the forms of mental derangement in which such hallucinations are most commonly observed, it has been my experience to find them in cases where melancholia was the prominent mental characteristic, and I have observed the hallucinations oftener, and continuing more persistently, in females than in males. Auditory hallucinations are very frequently observed in those suffering from recurrent attacks of insanity induced by alcohol, and it is interesting to note, as pointing to the localisation of the morbid condition underlying the sensorial disturbance, that the hallucination may be unilateral. Thus, for instance, I have at present under my care a man—a member of the Naval Reserve—recovering from an attack of acute mental disturbance resulting from over-indulgence in alcohol, who bitterly complained that the devil was constantly, but more especially during the night, whispering into his right ear, while he heard nothing in the left; and for this reason he used to wish to lie during the day on his right side with his ear closely pressed against the seat, but still, he said, this did not prevent the whispering.

"Such unilateral hallucinations will generally, I think, be found to be of a temporary character, depending in all probability on some acute source of irritation in the region of the auditory centre, and in cases of this kind visual halluci-

nations occur often at the same time; in the patient above quoted, while he heard the whispering, he declared he saw the devil in the shape of a dog, but only at night; but here the hallucination was not distinctly unilateral. The proximity of the visual and auditory centres, bordering on the posterior limb of the fissure of Sylvius, accounts, in all probability, for the occurrence of the visual and auditory sensorial disturbances at the same time. It seems likely also, that the systematised hallucinations here alluded to, in which the sensorial disorder retains the same characteristics throughout, differ, as to their cause, rather in degree than in kind from the varying and unsystematised hallucinations common in *delirium tremens*; the greater, and more rapid in its onset the source of irritation, the more varied and bizarre the hallucinations.

"Auditory hallucinations rarely take a pleasant form; when persistent and systematised, the voices heard generally refer to the persecution or injury of the subjects, or their friends. Thus I have at present under my care two female patients, one of whom hears every night the voices of her children, who are being murdered, and each morning accuses me of their destruction, while the other hears imaginary persons telling her that her husband has been put into a sack and drowned, and that she herself has been robbed. In these cases the same hallucinations have continued unchanged for several years, and constitute the basis of the mental disorder. Such hallucinations probably depend on the morbid excitation of the centre, which would in the normal condition be brought into action through the medium of the organs of sense. The view has been advanced however by some, that hallucinations cannot occur unless there be a morbid state of the nervous expansions of these organs. Dr Batty Tuke, in a patient who had suffered from auditory hallucination, found on post-mortem examination disease of the *portio mollis*, and in another case, the subject of hallucinations of smell, the same careful observer discovered a lesion localised in the neighbourhood of the olfactory bulbs. Pathological research has, however, as yet thrown but little light on the morbid anatomy of hallucinations, and we must for the present be content to

regard their causation by the light of what physiology teaches us."

Trötsch thought that there is a "nervous tinnitus aurium" and a "material or acoustic which may exist at the same time"—a double set of hallucinations, one distinctly aural, the other cerebral. Schwartz's opinion is important:—"Subjective aural sensations, which are caused by demonstrable affections of the ear, may, in predisposed persons, especially when there is hereditary tendency to mental disease, become the direct cause of aural hallucination, that may accelerate the outbreak of mental disease." Any one who has seen the distress caused to some by the unceasing roar in the head, and heard their declaration that "the noises would drive them insane if not relieved," must recognise the importance, in all those cases where aural tinnitus accompanies mental hallucination, of making a careful examination of the ear. Certainly there can be no doubt that such aural complication may accelerate and increase the mental affection.

Many patients assure us that "if only the noises could be cured, the deafness would not signify."

That the tinnitus is a pretty frequent accompaniment of deafness is evident from the fact that it was present in 133 of the 500 private cases I have recorded.

From what has been said it is obvious that, failing to determine the cause of the tinnitus by the local examination, or to remove it by inflation, we have to look outside the ear for its explanation.

Recurring to the anatomical data we have noted, we would naturally seek in their relative order of importance for the following causes: (a) those operating *in the blood and vessels*, as for example gouty increase of tension, albuminuria, granular kidney, and urine of low specific gravity, diabetes, anaemia, haemorrhages, haemorrhoids, atheromatous states of the arteries, tumours obstructing the circulation, thyroid enlargement, aneurisms, cardiac disease, the administration of toxic drugs; (b) *in the nervous system*: cerebral inflammations, tumours, degeneration, producing tinnitus either by direct or reflex irritation, or by the disturbance of equilibration in the labyrinth through pressure, disease of the cerebellum, affections of the meninges; (c) *general*:

mental worry, depression, over-strain, sleeplessness, night nursing, constant railway travelling, especially at night, alcoholism, syphilis, hallucinations associated with mania, dementia, melancholia, reflex irritations, as in the case of uterine displacements, sexual excesses, dyspeptic conditions with sympathetic disturbances, flatus, irritations of the fifth nerve, either from dental caries or tumours, affections of the naso-pharynx.

It is worthy of note that Urbantschitsch and others have found that those "after perceptions" produced by certain noises in persons under thirty, and lasting a given time after the objective source of sound, and to which he gave the name "positive after-images," have what he has called "subjective fields of hearing," and while some of these are situated in the forehead or back of the head, the seat of the "subjective field" has also been found in the naso-pharynx (Politzer).

The pathological relation between congested and hypertrophic conditions of the Schneiderian membrane and excessive sexual indulgence is of interest in connection with this physiological fact. Patients have often expressed to me the fact that the tinnitus was aggravated by frequency of the sexual act or by seminal emissions.

I afford myself a good example of a few well-recognised forms of tinnitus in one in whom the hearing power (at forty) is very acute.

A few years since I was alarmed by the occurrence of a bruit, which I distinctly heard shortly after going to bed, and which at times disturbed my rest. I occasionally heard it in the daytime, but very subdued, and only when reading in a quiet room, generally also on awaking in the morning. So closely did it resemble a cardiac bruit that I had my heart examined to satisfy myself that there was nothing wrong with it. Certain things increased its intensity, as night work, alcohol,—even the smallest quantity,—tea, strong coffee, any slight attack of indigestion. Changes of temperature, pressure over the mastoid, and more particularly in the hollow space over the styloid process, always arrested it; but it seemed after the pressure was relieved to return with increased intensity. The constant arterial "whiz" was most distressing at night, and I grew

uneasy lest any aneurismal condition of a tympanic or other vessel might be present. I tried different drugs, but not persistently, and at last I completely and permanently parted with my troublesome companion in the mountain air of Switzerland.

For two years I took no tea, and all coffee was diluted with milk; alcohol I altogether abandoned. In my case anaemia and over mental and bodily strain were the causes. I believe it was a vascular tinnitus from decrease of blood pressure. During the time I had periodical intermittent cardiac action. The hearing was not in the least affected. The noise was especially heard in the left ear. Lying on my left side generally increased it.

About three years since, when perfectly free from any aural disturbance, I was sleeping at a country house, some large trees facing my bedroom windows. I was struck a few mornings by the fact that, though no wind at the time was blowing, I heard a constant rustle of these trees. Finally I found that what I fancied was the noise of the leaves moving was in reality a subjective tinnitus. This has on and off returned to me since. It was induced by naso-pharyngeal congestion and a slight chronic catarrhal state of the Schneiderian membrane. I have relieved myself several times by a nasal alkaline douche. I have never found the tinnitus in the daytime, very rarely at night, but generally more or less in the morning after awaking. Lying on either side increased its intensity in the ear I lay on; pressure on the meatus greatly increased it; practising Valsalva's inflation obliterated it for a short time completely. Alcohol decidedly increased the tinnitus, so did any attack of indigestion. This was a tinnitus associated with altered equilibration in the air of the tympanum through Eustachian collapse or thickening, probably aggravated by tubal enervation. Exercise decreased the intensity of the sound; so did cold and dry weather; blowing air forcibly through the nares with the mouth shut diminishes the sound, and I have succeeded in obliterating it by the rapid repetition of several such acts.

Some of these symptoms are so common to all those who complain of tinnitus that I draw attention to them: the arrest of

a vascular tinnitus by pressure over, or in front, of the mastoid; the increase of a middle-ear tinnitus by pressure on the ear or closure of the external meatus; the effect of alcohol (likewise of tobacco) in generally increasing all forms of tinnitus; the action of tea and coffee in the same direction; the influence of weather, climate, and temperature, whether the atmosphere be dry and elevated, damp and low lying, moist, cold, or warm.

The mode of onset of tinnitus in many instances is also illustrated, the patient fancying that some familiar noise is heard, the subjective sound being projected in the direction from which the sound is supposed to issue; also the complete disappearance of the tinnitus in the daytime, and that even though there be at the time perfect silence. The effect of mastication in producing subjective tinnitus is noteworthy. Of this I have had several examples.

A curious and interesting case quite recently came under my notice, one which also, I think, establishes the dependence of megrim on labyrinthine disturbance independently of any cerebellar complication. The case was as follows:—

Mrs W., aged thirty-seven, has for some years suffered from slight deafness, increasing gradually, the hearing distance now reduced to $\frac{1}{100}$ in the right ear, and $\frac{1}{50}$ in the left; tinnitus like "steam," "drums," "whistles"; membrana tympani of both ears immobile on inflation; right—rigid, dull, and evident adhesion; left—cone of light still visible, rather concave, malleus prominent; Eustachian tube of both sides closed; the tuning-fork is heard through the bones of the head in the right ear, and louder on closure of the right meatus, whilst closure of the left makes no difference. When partaking of a meal "the first mouthful causes a decided giddiness, and the table appears to go round." The general health is good. Here it would seem as if the first movement of the jaw produced a disturbance of equilibration in the labyrinth, or it may possibly be a reflex central (cerebellar) excitation through the tympanic plexus and auditory nerves. This passes away after eating for a few minutes, only to return with a fresh act of mastication after a prolonged period of rest. I have

known several cases where sudden lateral movements of the head have produced tinnitus and giddiness.

Prognosis.—Most unfavourable are those cases in which we can discover little alteration in the appearance of the membrane, in which we have no evidence of middle ear exudation, and where the sound of the tuning-fork or watch is badly transmitted through the cranial bones, or when closure of the meatus makes no difference in the intensity of the note. So are those cases in which we have proof of old-standing tubal closure and enervation, middle-ear ankylosis and adhesions, with noises which have gradually increased until they have perhaps assumed intolerable proportions. The length of time the patient has suffered from the presence of the noise, and its constancy and character, may also guide us in our prognosis.

I have frequently found a loud roaring or rushing noise complained of in those cases in which the tinnitus yielded to no treatment, and where no abnormal state, recognisable, existed to account for it. I have come to look on musical sounds, and those likened to the roaring or rushing of water, as the most unfavourable in a prognostic point of view.

AURAL VERTIGO AND MÉNIÈRE'S DISEASE.

Definition and Causation.—It is necessary to define more accurately our meaning when we speak of aural vertigo, the frequent companion of tinnitus, and of that accompanying train of symptoms which are so often equivocally grouped under the head of "Ménière's Disease."

Attacks of vertigo proceeding from such causes as pressure in the external meatus, the effect of cold in syringing on the membrana tympani, and of inflammation in the external ear, though strictly considered forms of aural vertigo, are not correctly included in the definition and view of this affection which we are more familiar with. The vertigo produced by syringing through the middle ear into the nose in cases of perforation of the membrana tympani finds its explanation in Weber-Liel's experiment of pressing on the exposed stapes, when the degree of pressure exercised produced in succession all the phenomena of vertigo includ-

ing faintness and sickness of the stomach.

True aural vertigo is an affection characterised by attacks of giddiness, in varying degrees of severity from transient dizziness to actual vertigo, this reeling being accompanied or succeeded by nausea, if not by actual vomiting, and being preceded or attended by deafness and tinnitus. As we well know, a patient may suffer from aural vertigo and we may not be able to detect any defect in the auditory apparatus, and when the attack ceases the hearing may be perfect and the tinnitus disappear. As M'Bride has pointed out, we might speak of an aural, ophthalmic, and stomachic vertigo, to which we may add laryngeal (see p. 152).

These aural attacks and their accompanying subjective phenomena are strictly comparable to the migraine with its accompanying retinal disturbance and subjective phenomena to which, for several years, I was myself a victim. To consider the parallel conditions is most interesting. The irritation here is decidedly central, the peripheral disturbance in the retinal nerve elements being participated in by the retinal vessels. I have had my retina examined during these attacks, and nothing abnormal could be detected. I have had, in years gone by, as many as three of these migraine paroxysms in a day. They never interfered with my work. I have frequently lectured while under the influence of the attack, the faces of the students becoming more and more confused, until for some minutes the entire theatre appeared to swim about me, but it never interrupted my discourse. This once happened to me most awkwardly in delivering a public lecture. Fortunately it was imperceptible to my audience. At times I had partial hemiopia. Only once when I had rather a severe visit of the visual blurring and dazzling, which generally lasted in all about twenty minutes, did I become for a few minutes partly aphasic as well as amnesic. This was many years since. The giddiness, which came occasionally, was only slight and rapidly passed off. These attacks have now almost altogether ceased or only return at very long intervals. At first they were accompanied, or rather succeeded, by a most severe headache.

This generally supervened within about one hour after the attack had subsided, reached its climax in some three hours, and lasted six to eight hours, gradually subsiding. For years this has not been the case, only some slight heaviness of the head and tendency to nausea remaining for part of the day. I had no indication whatever of the approach of such attacks, and the only thing noticeable to friends was, that on those days I had a more "bilious" look, and I remarked myself the darkened circles under my eyes. To lie down (when I could do so) and close my eyes while the dazzling and interference with vision lasted, gave me most relief. But the zigzag lightning-streaks and the appearance of luminous clouds chasing each other in fantastic shapes remained when the eyes were closed, and, increasing the pressure of the eyelids, seemed but to intensify their luminous appearance. I found a few full doses of effervescent citrate of caffeine at times relieve me more speedily of the symptoms, and for the headache and sickness which followed, a tablespoonful of brandy was the best remedy.

Studying my own case carefully, I found that these attacks were always more frequent when there was any cause for brain and nerve exhaustion, with evident signs of indigestion and so-called biliousness. I have given lately, with benefit to persons similarly affected with the headache, a few large doses of effervescent bromo-caffeine, and it has acted, as one patient remarked, "like magic," but not so in other instances. Yet on the entire, for so-called "sick headaches" and "nervous headaches," it is a remedy well worthy a trial.

In that most interesting series of cases of xanthelasma palpebrarum, or vitiligoidea, collected by Mr Jonathan Hutchinson,¹ he has shown that in a large number of patients the yellow tumours or patches on the lower lids occurred in persons of bilious temperament, who suffered from sick headaches with temporary loss of vision at times amounting to blindness. Ophthalmoscopic examination at the time of the

attack revealed nothing. This new connective-tissue growth with its accompanying pigmentary changes is, as Mr Hutchinson well remarks, "a pathological consequence of frequently occurring physiological processes." And though the recovery from the visual disturbance is generally complete, and the loss of sight but transient, still permanent loss or alienation of vision has ensued in some instances. I have myself—immediately after the attack has passed away—frequently tested a patient's vision, and have found that with either eye I could read No. 1 Jaeger as usual. It never produced any astigmatism. My vision is still much above the average standard of normal acuteness of vision. I took frequently, and not without benefit, a course of nitro-muriatic acid and taraxacum, with periodical small doses of grey powder.

The aural vertigo we meet with in *debilitated persons*, and in atonic states, oftentimes attending irregularity of meals, over-press and worry of business, general anaemia with dyspepsia, is strictly analogous to its twin sister ocular vertigo. It may have its origin in some peripheral irritation, pneumo-gastric or sympathetic, or it may be a depraved blood-current which produces the central irritation in the hearing centre, more easily excited by perverted stimuli in these adynamic states, and the consequence is, as in the case of the retina, the subjective auditory phenomena. More frequently perhaps in the instance of the ear than of the eye, are there any local physical accompaniments or consequences, and a tinnitus rather objective than subjective is the result.

Aural vertigo we find caused also by such *middle-ear affections* as growths in the tympanum, collections of mucus and pus in it, exudations, ossicular and other intra-tympanic changes which produce intra-labyrinthine disturbance through stapedial immobility and pressure, mastoid and petrosal disease, and venous congestion in the sinuses. And in the internal ear we find associated with aural vertigo all those abnormal states which have been already enumerated as sources of tinnitus, and which may be subdivided under the seven headings—increase of labyrinthine pressure, vascular changes, nerve changes, rheumatism, gout, syphil-

¹ *Illustrations of Clinical Surgery*, p. 146. See interesting case of same affection, with observations and drawing, published in *Dublin Monthly Journal* (Pathological Society's Proceedings) by Dr A. W. Foot.

itic reflex disturbances, cerebral and cerebro-spinal affections, medicaments as quinine, saline, &c.

Though I think all *naso-pharyngeal affections* causing deafness should be looked on as so correlated to the accompanying or consecutive middle-ear morbid states that they must, strictly speaking, be included in the consideration of these, still I feel it is preferable distinctly to refer to them as a separate exciting cause of vertigo, if for no other reason than to impress on all the fact of the importance of the patency of the nasal passages in preserving the equilibration of the labyrinth. The mere mechanical obstacle which obstruction or closure of the nasal passages presents to the ventilation of the tympanum is by no means the most serious of the considerations bearing on the presence of vertigo arising out of an affection of the nasal mucous membrane, be it catarrhal, hypertrophic, ulcerative, or an enlargement of the turbinated bones from any cause, more especially of the inferior. Vertigo which results from the secondary tympanic changes consequent merely upon such obstruction is not of frequent occurrence. We have the best proof possible of this in the instance of nasal polypi, accompanying which it is comparatively rare to find deafness or tinnitus, and rarer still vertigo.

I have a patient at present who for a number of years has been subject to nasal polypi, and who has been again and again operated on, paying periodical visits to London for that purpose. I have seen both nostrils completely blocked with polypi. He is a good public speaker, and his speech has from time to time been so affected by the nasal growths that he has had to abandon the attempt to address an audience. He is about seventy years of age. In every other respect he may be said to be in good health for his period of life; his hearing is acute, he never has had any attack of vertigo, he suffers from no tinnitus. It is nearly two years since I removed all polypi from the nostrils, with portions of the turbinated bones, applying the galvano-cautery subsequently, and recommending the application of ethylate of sodium if there was a regrowth. There has been some partial return. But neither the polypi nor the medica-

tion have given rise to any aural phenomena. On the other hand, we constantly see patients with post-nasal catarrh in which plugs of hardened secretion fill the naso-pharynx, and in whom an ozaenatous state of the nostrils is present, yet there is neither deafness, tinnitus, nor vertigo.

Patients come with congenital enlargement of the pharyngeal wall, with hypertrophy of the pharyngeal tonsil of Luschka, with large naso-pharyngeal polypi, in whom all these vertiginous symptoms are absent. I have several times seen patients with such a deviation of the septum nasi that the mucous surfaces of the outer wall of the nostril and the septum were in apposition. There has been a deafness of the corresponding ear, but no vertigo and frequently no tinnitus.

I this day saw a patient from whom some time since, for a profuse muco-purulent discharge and hypertrophied mucous membrane, I removed the projecting portions of the turbinated bones, and freely applied the galvanic cautery, under cocaine, to the granular masses which covered the outer wall of the fossa. Subsequently he was treated with (30 grains to the ounce) solution of chromic acid. With a continuance of suitable treatment he is now greatly improved, though there is yet a slight discharge. There never was the least deafness, tinnitus, or vertigo in this case. A lady has just passed from under my care who consulted me for lateral deviation of the nose, caused by a fall she had some years since, and obstruction of the right nasal passage. The left side was occluded by the deviation, so as that only a small bougie could pass; the right was blocked by a cartilaginous growth from the right inferior turbinated bone. I could not get a small bougie past the obstruction. *There was no aural symptom.* Yet it was most unpleasant to hear her effort at nasal breathing, and her speech was affected. This had been growing worse for some considerable time. Under ether I cut off the globular projection and forcibly straightened the deviated septum. I then applied a septum splint and maintained patency by bougies. All the symptoms have disappeared, and the nose is straightened permanently.

Children with post-nasal obstruction

from adenoid growths of the naso-pharynx—whose respiration is so affected that the chest presents the peculiar “pigeon-breast” deformity seen in such cases, and remarked on by Löwenberg, and many characteristic examples of which I have seen—even where these growths are attended by contraction of the nasal passages and swollen nasal mucous membrane, do not suffer from giddiness. It would appear, therefore, from these clinical facts of everyday experience that the coincidence of vertigo and tinnitus, in a given proportion of disordered states of the naso-pharynx with accompanying impediment to nasal breathing, is difficult accurately to explain if we do not include interference primary, or secondary, with the equilibration of the labyrinthine fluid as the cause. It may in many cases be idiosyncratic. There may be required some special inherited susceptibilities and abnormal excitability of the hearing and vertiginous centres to account for the slight disturbance in the physiological balance producing the symptom in some individuals and not in others.

The extensive nerve connections in the naso-pharynx, motor and sympathetic, through the cerebro-spinal nerves and sympathetic ganglia, and the distribution of these nerves to the several vessels supplying the large vascular area which includes the entire auditory tract and naso-pharynx, are sufficient anatomical grounds on which to explain the healthful physiological relations maintained between the nasal respiratory function and the circulation in the naso-pharynx, tympanum, and labyrinth. The equilibration of the labyrinthine fluid and the inhibiting function of the hearing centre and cerebellum, including the efficient control by these of any perverted impulses which may be excited in these parts through morbid processes involving the peripheral nerves, have a correlation which these anatomical considerations explain. I have before referred to the special connexion which appears to exist between the naso-pharynx and the hearing sense.¹

Dr Woakes considers that the cervical ganglia of the sympathetic, through their widely distributed afferent and efferent connections with the correlated vascular areas over which their branches preside,

play the most important part in the production of aural vertigo. The primary deviation may occur in the afferent ganglionic nerves, leading to local changes in the tissues, nasal and pharyngeal, producing ganglionieurosis, which, through the efferent nerves, results in dilatation of the vessels in the correlated vascular areas and consequent congestion. He regards the inferior cervical ganglion especially as the one whose normal correlating function in its widely-distributed branches of distribution is more especially essential for the maintenance of healthful nutrition in the correlated areas. And vertigo he looks on as one result of functional disturbance in any of the correlated areas presided over by this ganglion. The phenomenon may be reflex, or, as in the case of goitre, be due to primary lesion of the ganglion itself (the middle and superior ganglia, it may be, being also involved, as in Dr Shingleton Smith's case), the direct effect of the ganglionic lesion being vaso-motor paralysis of the inferior thyroid artery, and hence the goitre.²

It appears that in the anatomical relations already epitomised, and more especially those of the roots and nuclei of the auditory nerve with the restiform bodies, the peduncles of the cerebellum, the floor of the fourth ventricle, the contiguity of the auditory nuclei to those of the facial sixth and eighth pairs of nerves, and in the relation of the ampullar and vestibular nerves to the cerebellum, we have a most important explanation of reflex aural vertigo. The second and equally important anatomical connection to be remembered is the numerous links which connect the different cerebro-spinal ganglia with the cervical sympathetic and the vaso-motor centre in the medulla.

A chain of continuity is thus maintained between the pneumo gastric nerve and its branches and the nerves supplying the naso-oral and naso-pharyngeal regions, with the sympathetic supply of these parts, which explains the various vaso-motor effects on the blood-vessels of the labyrinth, tympanum, and naso-pharynx, effects which are immediately made manifest through the semicircular canals in the disturbance of equilibration in the fluid of the labyrinth. We have no

¹ See p. 36.

² Woakes on *Post-Nasal Catarrh and Deafness, Giddiness, Noises in the Head*, 3rd edition.

difficulty from our physiological knowledge of the allied functions of the semicircular canals and cerebellum, in understanding how such nerve communications produce vertiginous sensations ; and if we agree with M'Brude¹ that there is a cerebellar vertiginous centre the numerous reflex causes of, and the varied phenomena which attend upon vertigo, find a still more ready explanation.

The vertiginous troubles which all otologists are familiar with in patients suffering from tumour of the brain are little different in my experience from those met with when the tympanum is filled with a morbid growth. Thus I once had two patients attending hospital at the same time, the one with a large mass of granulations in the tympanic cavity, the other with evidence of a central cerebral irritation (probably syphilitic gummatata) in the neighbourhood presumably of the fourth ventricle. Both had periodical attacks of severe vertigo, when they would fall to the ground if not supported, and swoon off. The most noticeable difference in the symptoms was, that in the case of the man with the intra-tympanic growth, during the intervals between the attacks the vertigo did not entirely leave, as there was uncertain and staggering gait, with a tendency to reel. The patient with the cerebral affection had optic neuritis of the right eye, which was blind ; the neuritis finally became double. He came into hospital for some time. There was tinnitus in both ears, but not loss of hearing. He always reeled towards the right side in the vertiginous attacks, turning rapidly towards this side before falling. There was violent occipital pain. Injections of pilocarpine and a seton in the neck relieved the occipital pain. I did not see the termination of the case. The other patient recovered completely after the removal of the growth from the tympanum and subsequent treatment of the tympanic cavity.

Ménière's Disease.—Much confusion has resulted from the adoption of this name for a group of symptoms which it is certain includes widely dissimilar pathological conditions. It is a mode of classifying or identifying a disease or group of symptoms which has always the most disastrous results in point of accuracy of

association of pathological causes, and the symptoms, especially when we name the disease after an authority whose sources of observation of the pathological conditions connected with it were limited, as in the instance of Ménière's affection.

This "authority" method of nomenclature I believe to be a disastrous one for students, as indeed it is for us all. Acquaintance with the name of the investigator is too frequently made to stand either for a knowledge of the disease, or it justifies a very muddled conception of it. We must take much that has been said with regard to the occurrence of tinnitus and aural vertigo into consideration when we are making a diagnosis as to the presence of Ménière's affection, nor can we well separately study these affections apart.

In regard to this patient's reeling to the right side, it will be remembered that Guye of Amsterdam, grouping all those cases in which a sensation of vertigo is caused by abnormal irritation of the nervous terminal apparatus of the semicircular canals under the head of Ménière's disease, notices that the first sensation is one of rotation around a vertical axis and *toward the affected side* (this I have distinctly confirmed myself), followed, before the vertigo is complete, by a sensation of rotation about a transverse axis, forward and backward, the vertigo then becoming complete, and the patient swoons with or without loss of consciousness and vomiting. Guye also calls attention to the tremulous character of the handwriting in the early stages of Ménière's disease.

Pathology.—In many cases of Ménière's disease the middle-ear appearances and the pathological changes in the middle ear are those we are familiar with in various forms of aural vertigo.² In those cases in which we have negative evidence of any brain lesion the pathological causes of the vertigo and deafness are likely to be present in the form of secondary degenerations of blood or lymph effusion, with consequent connective-tissue formations in the cochlea and semicircular canals. Such conditions, even in a minor degree, with the accom-

² See the pathological changes in the middle ear and labyrinth in the case of leukaemia attended by tinnitus and vertigo reported by Politzer, page 15.

panying nerve degeneration, are little, if at all, amenable to therapeutical remedies. They teach us that in every treatment, while effusions are still recent, we have the greatest reason to hope for results from local and constitutional remedies.

Lorenz Eckert, reviewing all that has been written on Ménière's disease, and the particulars of all recorded cases, arrives at these conclusions:—(1) The semicircular canals, with their ampullæ, are the organs of the sense of co-ordinate motion, directly for the head, indirectly for the entire body. (2) The localisation of sound is determined by binaural power of hearing. The semicircular canals take no part in this, but possibly exert acoustic functions in other respects. (3) The appearance of the various symptoms of Ménière's disease is in most cases attributable to a diseased state of the terminal apparatus of the acoustic nerve in the labyrinth. It is only in rare instances that these are called forth by pathological changes in the adjoining nerve-centres. (4) Pathological changes of conditions in the middle ear and in surrounding structures, producing a change in the intra-labyrinthine pressure, may call forth a similar train of symptoms. (5) The symptoms are induced by an irritation of the labyrinthine organs or their nervous centres. Complete destruction of the same seldom calls forth a loss of function. (6) Disturbances of co-ordinate motion may be absent in pronounced chronic or acute affections of the labyrinth. (7) Constitutional diseases, such as syphilis, leukaemia, epidemic parotitis, and tabes, are recognised factors predisposing to the development of Ménière's disease.¹

Causation.—Amongst the more frequent of the assigned causes of Ménière's affection we find injuries, catarrhal condition of the middle ear following cold or sea-bathing, nasal obstructions, syphilitic exudations in the middle ear and labyrinth. Guye states that the symptoms may follow fissures of the skull during cicatrisation (see the preceding chapter on the causes of tinnitus and the remarks on the causation of aural vertigo).

It would appear far better, following Politzer, to limit the term Ménière's

affection to those sudden apoplectiform attacks of deafness in which the typical train of symptoms of aural vertigo are present.

In all the cases I have seen, during the chronic stages blindfolding the eyes at once accentuated the giddiness. Though the phenomena which mark the onset of the affection may be the first indication to the physician of the occurrence of the lesion in the labyrinth, obscure auditory symptoms may for some time precede this, such as sensation of fulness, and pulsating tinnitus, and slight deafness. I think such cases as the following represent true Ménière's affection:—

Mr —, age twenty-five. Ears have troubled him since childhood, when he had an abscess in the meatus of the right ear; has had no inconvenience till the last two years; since then has gradually become deaf; deafness attended with tinnitus "like steam"; suffers occasionally from "giddiness and rolling about as if drunk"; with the first onset of the symptoms he fell to the ground, and a few times subsequently; this was attended with nausea and sickness of the stomach; can ascribe no cause; father deaf. On examination:—*Right ear*—watch not heard on contact; *left ear*, barely on contact; external meatus of both ears healthy; M.T. (of both ears) cones of light absent, membranes dull looking and rigid; E.T. (both ears) free; cavity of tympanum gives a dry crackling sound with otoscope; tuning fork badly heard through the head, closure of the meatus diminishing the sound in both ears; naso-pharyngeal mucous membrane generally relaxed, and catarrhal.

In connection with the subject of aural vertigo, Charcot's laryngeal vertigo must be mentioned. Charcot described such vertiginous attacks complicating cases of gouty bronchitis and asthma, in which there was an accompanying laryngeal irritation. Some only of these vertiginous paroxysms were attended by convulsive movements and unconsciousness. Krishaber (*Annales des Maladies Coreilli*, March 1882) records a case associated with syphilis in which the starting-point of similar attacks was the larynx; Gray and Lefferts (*American Journal of Neurology and Psychiatry*,

Nov. 1882; *Archives of Laryngology*, July 1883) have recorded similar cases of "laryngeal epilepsy." Gottstein, who with Krishaber believes that these attacks are due to spasm of the glottis, and that the syncope attendant on them is brought about by the effect on the blood pressure immediately at the close of a full inspiration. He supports this conclusion by the observations of Weber (*Muller's Archives*, 1851), who proved that forced expiration with closed glottis had a similar effect both in his own person and with others. Dr M'Bride of Edinburgh has carefully detailed the particulars of a case, and agreeing with the above view.

I have under my care at the present moment a lady who is always threatened with syncope and some vertiginous symptoms during the act of defecation. She is rather of a neurotic temperament, and has a feeble cardiac syncope. Curiously enough, there is a chronic throat and laryngeal trouble in this case, which has been present for years, and for which she has tried the effects of various climates. M'Bride makes the important observation "that the aural surgeon will do well to abstain from recommending Valsalva's experiment without first ascertaining the condition of the heart"¹

CHAPTER XVIII.

TINNITUS AURUM AND VERTIGO—*continued.*

TREATMENT—INDICATIONS FOR—INFLATION OF TYMPANUM—INTRA-TUBAL CATHETER OF WEBER-LIEL AND EUSTACHIAN CATHETER—RAREFACTION OF AIR IN TYMPANUM—PARACENTESIS OF THE MEMBRANA TYMPANI—BLOOD PRESSURE IN TINNITUS—EFFECT OF MEDICINES, ETC.—TOBACCO IN, EFFECTS OF CLIMATE ON, ELECTRICITY IN, TREATMENT OF VERTIGO—USE OF PILOCARPINE IN MÉNIÈRE'S AFFECTION.

TREATMENT OF TINNITUS AND VERTIGO.

With regard, in the first instance, to the treatment of tinnitus, we may broadly say that the indications are (*a*) to restore equilibration in the middle ear and labyrinth; (*b*) to correct abnormal tension (excess or decrease) in the vessels of the tympanum and labyrinth; (*c*) to regulate general arterial tension; (*d*) to modify and control excess of reflex excitability and morbid central impulses; (*e*) to correct local causes of pressure, traction, irritation; (*f*) to restore tone to enervated tubal and tympanic muscles; (*g*) to promote healthful nasal respiration by attention to the naso-pharynx, and to subdue congestive and inflammatory states of the naso-pharyngeal mucous membrane.

To restore Equilibration in the Middle Ear and Labyrinth.—In simple cases, where the function of the Eustachian tube is interfered with either through collapse or closure, the employment of Politzer's method of inflation removes

for the time being, and, when periodically repeated, permanently, both the deafness and tinnitus. Constantly lesser degrees of noise and the dulness of hearing which accompanies them may be cured by the free use of Politzer's bag. With my bag for auto-inflation the patient can himself sustain the effect. He may also with it inflate the tympanum with air charged with chloride of ammonia vapour or iodine. In all cases of tinnitus, dependent on middle-ear conditions secondary to naso-pharyngeal catarrh, congestion, or follicular hypertrophy, in collapse or closure of the Eustachian tube due to enervation of the tubal muscles, in temporary accumulation of secretion in the tympanic cavity, even in old chronic cases of progressive deafness due to any combination of these causes, the value of Politzer's method of restoring equilibration to the tympanum is indisputable. The mode of performing this simple therapeutical operation is fully entered into in the chapter on Diagnosis.

The use of the Eustachian catheter,

¹ *Diseases of the Larynx*, Gottstein, translated by P. M'Bride, M.D. (Johnston, Edinburgh).

especially the intra-tubal catheter of Weber-Liel, in a number of cases is called for to open the Eustachian tube and to inflate the tympanum either with air or a medicated vapour. It is also required for the injection of fluids into the tympanum. Of the former, the vapour of chloride of ammonia I have found most useful in catarrhal states of the tympanum and naso-pharynx ; of the latter, warm solutions of iodide of potassium, bicarbonate of soda, and chloride of ammonia. The method of using the catheter for these purposes is also described in the chapter on Therapeutics.

Rarefaction of the air in the external meatus, and the consequent increase of pressure on the tympanic membrane by the air in the tympanic cavity, will occasionally, or at least temporarily, relieve tinnitus. This result is best secured by placing a nozzle covered with rubber in the external meatus, and having attached to it a tube which can be placed in the mouth. The meatus is thus hermetically closed, and suction applied by the mouth exhausts the air in the meatus. This plan can be resorted to by the patient himself. It is of more especial benefit in cases in which there is collapse accompanied with considerable concavity of the membrane. M'Keown's recommendation to apply collodion to the membrana tympani in cases of relaxation and excessive concavity with a tendency to adhesion is worth remembering, and has decidedly in some cases a good effect. It may be applied with my aural probe armed with cotton-wool.¹

The other therapeutic steps for securing equilibration I shall allude to are—(a) the operative procedures for securing an artificial opening in the membrana tympani ; (b) section of the tendon of the tensor tympani muscle. There is no doubt that incision of the posterior segment of the membrana tympani frequently relieves both deafness and the louder subjective noises which are even more distressing than the deafness. Unhappily the subsequent closure of the opening is attended by a return of the noises, sometimes, I have thought, with greater intensity than before. This is not the place to refer to the method of performing this operative step. Suffice

it to say, that if carried out with good illumination, proper fixation of the head, and attention to the site and extent of the incision, it is one which is rarely attended by unpleasant results, and may be performed by any steady hand. It is well to insist on this for other reasons, which I have given when referring to accumulation of fluid, whether of pus or serum, in the cavity of the tympanum. A few applications of Von Brüi's styptic wool are generally sufficient to stay the bleeding.

We avoid haemorrhage and secure greater and more permanent patency by Voltolini's method.² The battery I use for making the small platinum knife red hot is that of Smee (made for me by Krohne and Sesemann), the current being completed when the cover of the battery is raised, so that the knife becomes instantaneously red hot. It is in those cases where there is considerable deafness with loud noises, and in which other measures do not succeed, or where we fail to open the Eustachian tube, that paracentesis does most good.

The lesson we are taught daily by pathological openings in the drumhead should not be lost. How seldom do we find tinnitus with permanent perforation, and how consistent with good hearing is a comparatively large perforation ! If there be a certain degree of freedom of the stapes and mobility in the membrane of the fenestra rotunda, and absence of disease in the labyrinth, the removal of the obstacle to the transmission of the sound-waves, present through rigidity and fixation of the membrane, or from its application to the promontory through collapse, adhesions, or displaced and ankylosed ossicles, explains the benefit which, independently of the provision for the exit of any imprisoned secretions, permanent perforation of the drumhead confers. Of section of the tendon of the tensor tympani to relieve tinnitus, so strongly advocated and freely practised by Weber, Liel, Hartmann, and others, I do not speak here. I have done so fully elsewhere. It is not an operation that has found much favour in this country. Nor is it one which comes within the experience of the practitioner to carry out.

The second indication to correct abnormal tension (excess or decrease) in

¹ Dr M'Keown also uses collodion for keeping an artificial perforation open.

² See page 76.

the vessels of the tympanum and labyrinth, may be considered in relation to the third, to regulate general arterial tension. The measures just described bear more particularly on the first of these indications, as the tension locally of the vessels will be affected by the influences exerted on the blood in them—by increased or diminished pressure of the air in the tympanum, as also by the character of that air, and its capacity for interchange with the gases of the blood circulating in the tympanic capillaries. Indirectly also are the same influences felt in the labyrinth. In this instance the consequences of increased or diminished pressure are produced by alterations in the density and degree of compression of the perilymph and endolymph, these alterations in their turn being dependent upon the intra-tympanic changes already referred to in the membrane, ossicles, and fenestrae. Quinine, we are aware, in large doses produces both the giddiness and tinnitus of Ménière's disease.

The tympanic and labyrinthine disturbances of equilibration affect the tension of the vessels in both tympanum and labyrinth. And whether the blood-pressure be increased or diminished, the consequence is frequently tinnitus. How far increase of blood-pressure affects the fluid in the labyrinth we do not know; clinical facts would tend to show that it does materially do so (see remarks on Laryngeal Vertigo).

Treatment.—We find two clearly distinct classes of patients in whom the symptom of tinnitus is present, the distinction being generally so evident as to broadly indicate the lines of therapeutic action. *In one group* there is slow and feeble action of the heart, perhaps attended by occasional intermittence; the pulse at the wrist varies in force and character,—it may be full but compressible, or feeble and easily obliterated; the temporal arteries are dilated; the veins on the backs of the hands are unduly prominent; auscultation reveals an imperfect cardiac systole or diastole; the digestive powers are weak; there is a tendency to general nervous depression, and the occasional attacks of giddiness or faintness are evidences of cerebral anaemia.

It is in these cases we find benefit derived from such drugs as iron and

its combinations, digitalis, convallaria, arsenic, quinine, strychnine, caffeine, ergot. The bromides have to be administered with caution, and it is a question if any temporary relief due to diminished irritability of the reflex and cardiac nerve centres compensates for the depression which is attendant on their prolonged employment. The bromide salts of caffeine, zinc, and iron will, however, often be found most valuable given in combination with other vascular and nerve tonics. I have constantly found hydrobromic acid with quinine and pyrophosphate of iron useful. The use of alcohol in such cases in any quantity I have little doubt is most injurious; the secondary dilatation of the arterioles which follows the use of alcohol, especially in the intervals between its administration, increasing the tinnitus, while the cardiac irregularity and gastric disturbance which it frequently causes still further adds to the mischief. A small and defined quantity of alcohol taken with food in cases of weak appetite, and such wines as St Raphael, Burgundy, claret, and the red Australian wines are of service in anaemic states; though even this amount of alcohol we find in many persons aggravates the noises.

Tobacco has also a tendency in many persons to increase the tinnitus, if not primarily to cause it. Remembering the influence of tobacco on the heart (Handfield-Jones), I should say that complete abandonment of the habit in the class of case I have just described is imperative. The lesson learnt by the action of tobacco on the retina in producing atrophy of the papilla and amblyopia should not be forgotten in the instance of the auditory nerve. Though we have not the same direct evidence of its effects, the possibility of tobacco deafness and tinnitus should be remembered. As with the eye so with the ear,—the total relinquishment of the practice of smoking gives the patient the best chance of recovery.

In the second group of cases there are the general evidences of increased arterial tension in the incompressible radial pulse, throbbing carotids, rigid vessels, ocular phenomena, sleeplessness, headache, and sense of fulness in the head. We frequently find that organic changes in the vascular system or the kidneys accompany this increased arterial tension.

Aortic stenosis, and mitral insufficiency, aneurismal tumours, atheromatous degeneration, Bright's disease, contracted kidney, are perhaps the most frequently met with of these organic sources of tinnitus. In gout, rheumatism, chronic alcoholism, diabetes, and transitory glycosuria the same condition exists. It is present in females who suffer from erratic or suppressed menstruation, and is not uncommon at the menopause and during pregnancy. Excessive indulgence in tea may produce it. I have drawn attention to the frequent occurrence of tinnitus in the case of cerebral tumours and other degenerative changes both of the brain and spinal cord, and have elsewhere detailed the particulars of a case in which tinnitus aurium was the earliest symptom of the subsequent fatal growth in the brain, which ultimately involved nearly all the nuclei of the cranial nerves.¹

It is especially in this increased tension tinnitus that bromide of potassium gives such relief. I do not think it is of equal value to hydrobromic acid, which is the most reliable medicine I know of for the relief of hyperæmic tinnitus. It should be given in thirty-drop doses, and may well be combined with such medicines as digitalis, convallaria, or quinine, when these are indicated. The hydrobromate of cocaine is likely to prove a useful agent for tinnitus in doses of a quarter to one grain. I have given, as first advocated by Turnbull, hydrobromic ether, held in suspension by a little powdered acacia and glycerine in three to five minim doses with advantage (see formulæ). It may also be blown into the middle ear through the Eustachian catheter. Nitrite of amyl and nitroglycerine will often afford temporary relief from the noise and throbbing in the ears. I have known inhalation of nitrite of amyl give great relief in several cases of tinnitus attendant on granular kidney, and in other forms of hyæmæria in which the urine was of low specific gravity. Ergotin and sclerotic acid are valuable remedies in cerebral hyperæmic conditions attendant on cardiac irritability, and alone or in combination with digitalis often mitigate distressing tinnitus. Hamamelis may be

given for the same object in combination with ergot.

It is in this class of patients that the morning administration of some saline aperient waters following on such vegetable cholagogues as iridin, euonymin, podophyllin, or occasional small doses of mercurial powder or pill, will have a beneficial effect on the tinnitus. In the cold air of the Upper Engadine, at such Scotch health resorts as Strathpeffer and Pitlochry, or in the milder air of Ilkley, Matlock, or Malvern, this tinnitus will sometimes disappear, while if there be a gouty diathesis to contend with, some of the legion of reputed spas, home or Continental, may be selected according to the character of the case. I have known a most troublesome gouty tinnitus completely cured by a sojourn at Kissingen, while that due to a syphilitic taint has disappeared with a course at Aachen.²

Turning our attention to the next indication of treatment "to control excess of reflex excitability and morbid central impulses," we have only to emphasise much that has already been said. In the absence of syphilis, middle-ear changes, or affection of the labyrinth, we may find the cause of the tinnitus in some functional derangement elsewhere. Flatulence I have known to cause both temporary pain and tinnitus in the ear. Gastric derangement, hepatic sluggishness, costiveness, uterine functional error, have all to be inquired after and if possible rectified. Overwork and worry, the handmaids of modern professional or mercantile success, through the wear and tear of body and mind which are inseparable from the excessive strain, the anxiety, the excitement caused by train, telephone, and telegram, both directly and indirectly, are often answerable for the presence of subjective noises in the ear. Such physical and mental excitement, when supported on alcohol or lulled by tobacco, have in them all the elements which predispose to vascular disturbances and nervous irritability. Add to this constant hurry and skurry on "the weary high road" to wealth or fame, sexual excesses, long intervals between food and irregularity in meals, and we

¹ *Practitioner*, 1885, vol. xxxv.—"Short Notes on Therapeutics," *Ocular Therapeutics*.

² Royat and Bourboule in the Auvergne (Puy-de-Dôme) may specially be recommended to overtaxed and enervated gouty patients, or Gastein in the Austrian Tyrol.

have a ready explanation of the disappearance of tinnitus in the enforced rest of the Mediterranean trip or other sea voyage. It is idle to hope to cure such a tinnitus while the rush which has brought the "uncertainty of voice and sight and touch and tread" continues. Lessening of work, change of air, total rest when possible, horse exercise, games of golf or tennis, a yachting cruise, regular meals, avoidance of sexual intercourse, are the remedies more calculated to do the patient good in the present and prevent aural mischief in the future than repeated dosings of bromides and tonics.

The correction of "local causes of pressure, traction, and irritation" are discussed elsewhere in treating of the affections of the outer, middle, and internal ear produced by these. In the smallest particle of wax or the delicate covering of a grass seed resting on the membrane, we may find the local cause of tinnitus. This only establishes the necessity of the general rule, in all cases in which we are consulted for tinnitus, to examine the ear in the first instance, both by speculum and otoscope.

In the effort to restore the tone of enervated tubal and tympanic muscles we may resort to either the galvanic or faradaic current. I cannot say that the choice is not frequently an empirical one. In selecting a simple battery for the latter purpose I would recommend the small bichromate one (Mayer, Meltzer, and Maw) used for laryngeal faradism, the strength of which can be so delicately increased, and for the former the Leclanché elements as made by the Silver-town Company. Our choice of current must in great measure depend on the effect produced.

The satisfactory application of electricity¹ to the ear is in practice attended with many difficulties. Patients are so differently constituted to bear even weak currents, some refusing altogether to submit to internal galvanism; they are impatient of a treatment which is unpleasant if they do not experience speedy results in the diminution of the noises or the deafness; the practitioner cannot truthfully deny that there is much that is experimental in the treatment, while to carry it out with any prospect of success absorbs time and is attended by

expense to the patient. "My accumulated experience," says Politzer, "indicates that galvanic treatment effects a lasting improvement in the function of hearing only in a few cases, and complete removal of the subjective noises extremely rarely; but that very often, after longer or shorter treatment, the intensity of the subjective noises and their annoyance are lessened for a long time, and that besides, the head symptoms accompanying ear diseases are either quite removed or greatly improved. On the other hand, he notices that aggravation of the symptoms sometimes follows the galvanic treatment, the noises becoming more intense, and general excitement attending even a few sittings."

This expression of opinion on the part of such an experienced authority I venture to quote, as I feel that it completely accords with my own experience of electricity. In cases in which galvanism has done good I have always been in doubt if the benefit was not at least as much derived from other treatment accompanying its use as from the galvanism alone. I have known both the galvanic and faradaic current apparently relieve for the time being both tinnitus and deafness, but as a rule this has been only a temporary relief. We cannot rationally expect much benefit from any physiological or therapeutical effects of electricity in those cases in which an examination affords clear proof of serious organic changes in the middle ear or labyrinth. It is rather in those patients in which the examination by the speculum, otoscope, and tuning-fork points to tubal collapse as the principal cause of the tinnitus, and that other correlative evidence leads to a belief that there is a condition of enervation not alone of the tubal but also of the tympanic muscles, producing by pressure or otherwise disturbance of equilibration in the labyrinth, that electricity is likely to be of service.

Nor must we omit hysteria as a cause *per se* of both tinnitus and deafness.

There is essentially a nervous functional deafness, possibly accompanied by tinnitus, in which there is neither paralysis of the auditory nerve nor any physical change in the middle ear or labyrinth to account for it. And the knowledge that such subjective sensations and loss of function have been,

¹ See page 77.

through the agency of metallotherapy, transferred from one ear to the other, still further strengthens the belief that both the subjective phenomena and functional aberration, oftener than we may suspect, either have their source in, or are aggravated by, hysteria. Under certain abnormal mental states brought about by shock, fright, grief, excitement, the hearing has been temporarily lost ; and I have no doubt of the fact that, especially in the instance of the ear, does the concentration of the mind on the offending organ accentuate the functional as well as physical mischief which may be present. Change of occupation, scenery, surroundings, and amusements which divert the thoughts from the offending organs, thus do service. Much of the increase of tinnitus which is complained of at night or in the early morning hours when persons first awake is due as much to mental depression, often present at this time, and the involuntary and almost irresistible tendency to *think* of the noise, as to the surrounding stillness and absence of sound. Such morning tinnitus will often completely disappear on rising and giving the mind some active occupation.

All these considerations explain why it is so difficult to say whether the improvement which follows the use of electricity is due to it or to other treatment which generally accompanies it. Arguing from analogy, we would, however, expect good generally to follow its employment, not alone in patients in whom diminution of hearing and tinnitus are dependent upon functional loss of power, both in nerve and muscle, but also in cases in which such symptoms are due to incipient degenerative changes in the nerves and muscles which appertain to the middle ear and Eustachian tube. There can be little doubt that Weber-Liel's method of intra-tubal galvanisation by means of a fine Eustachian catheter and projecting silver wire, is the most direct and efficient means of acting on the tubal and tympanic muscles.

Weber-Liel has always been a strong advocate for the use of intra-tubal electrification in tubal enervation, Eustachian collapse, and chronic middle ear catarrh, attended by altered states of the intratympanic muscles. Whether the improvement, which undoubtedly often

follows the application of electricity by the intra-tubal method, is due to the stimulation of the tubal muscles by the passage of the bougie, or to the current, it is difficult to say (Burnett). Most frequently we will find a marked improvement follow from the passage of a fine intra-tubal bougie.

Vertigo.—If the tinnitus be attended with giddiness and true aural vertigo, it will be our duty to endeavour accurately to define the cause of the latter symptom (see *Causation of Tinnitus and Vertigo*).

It is in those cases in which we find diminished tension of the blood-vessels and decrease in the force of the heart's systole that, early in the appearance of the tinnitus and vertigo, attention to dietetic rules, hours of rest, the prescription of a holiday at a bracing health resort, a short sea voyage, curtailment of the hours of business, the regulation of exercise, do more than medicines towards effecting a cure. A course of iron and quinine, arsenic, iron and quinine, quinine and digitalis or convallaria, quinine and strychnine, bromide or phosphide of zinc, pyrophosphate of iron with strychnine, the bromides of iron and potassium, hydrobromic acid with iron or strychnine may be prescribed according as the general features of the case indicate and suggest. In a great number of cases the combination of quinine, digitalis, and hydrobromic acid or bromide of potassium will be found an excellent one, and if iron be indicated the administration of Fellows' syrup at meal times will give good results. In most of these cases there is weak digestion. Therefore we must supplement these medicines by the administration of some digestive ferment, such as a preparation of pepsine with hydrochloric acid, lactopeptine, papaic, or a malt extract, while we attend to the secretion of the liver by the exhibition of some gentle cholagogue occasionally.

If we have reason to suspect intratympanic and intra-labyrinthine effusions, or recent secondary formations, iodide of potassium, and the other iodides, in full doses and in prolonged administration, would seem to be the remedy from which we are likely to derive the greatest benefit. It is well to repeat the most important lesson is that which shows the necessity for early and active treatment in such cases while effusions are recent,

and any secondary formations fresh and soft. It is at such stages that we may most hope for results from the iodides and iodine administered by the mouth and skin, and the trial of such waters as those of Woodhall Spa and Kreuznach. Mercury also, especially if we suspect a syphilitic taint, may be given alternately with the iodides. Its method of administration must in great measure depend on the diathesis and temperament of the patient. But where these latter do not contra-indicate and the iodides appear to fail, I think we do wrong not to exhibit mercury, keeping below the point of its therapeutical manifestations whether syphilis be present or not, such preparations as the bichloride or bicyanide of mercury, a mild course of inunction with lanolin mercurial ointment, being the best methods of administration.

It is a question if we avail ourselves of the action of pilocarpine as frequently as we should. It is probably the most certain and powerful of all our drugs in cases suitable for its administration, where the reduction of vascular tension is our object, and in which we desire to check effusion and control the tendency to extravasation. These are exactly the conditions in the earlier stages of Ménière's disease and other forms of vertigo in which labyrinthine effusions are threatening or occurring. At the Milan congress (1880) Professor Politzer drew attention to the use of subcutaneous injections of pilocarpine in syphilitic exudations of the labyrinth, and then inferred that it might prove of service in other than specific affections of the internal ear. The strength of the solution he is in the habit of using, and which is nearly the same as that I have myself employed, is a two per cent. solution, injecting three to six drops into the arm for each dose.¹

The treatment may be abandoned if after fourteen days no result is apparent. Otherwise it may be continued daily until a decided improvement is manifest. This is attained in periods of time varying from six to forty days. It is not uncommon to find the progress vacillating. But as a rule the greatest advance is made during the first fortnight of the

treatment. During the administration there should be no other local or internal treatment pursued. A few out of the several remarkable and typical cases instanced by Professor Politzer are well worthy of notice.² In July 1871 a Russian gendarme contracted primary syphilis, which was followed by secondary symptoms, and was treated by mercury and iodine. In January 1881 he was attacked by deafness of both ears, tinnitus, giddiness, sickness, and violent pain in the occipital region.

The right ear was first affected; uncertainty of gait followed, especially if he was in the dark. The acoumeter (or Hörmesser) was not heard on contact with the right ear or on the corresponding temple, while loud speaking conveyed only the idea of sound. With the left ear the acoumeter was heard at the distance of a meter and a half, and whispering at five meters. The tuning-fork placed on the head was heard only with the left ear. Inflation made no difference. After the first injection of pilocarpine speech was heard at sixteen centimeters by the right ear, after the fourth at half a meter, after the eighth at four and a half meters; at the end of the fourth week the hearing distance of the left ear was normal and loud speech was heard at five and a half meters.

Another instance was that of a lawyer, aged thirty-two, who had been very deaf in the left ear from sclerosis and middle-ear catarrh. In September 1884 he contracted primary syphilis, which was followed by secondary symptoms and an ulcerative pharyngitis. He was benefited by special treatment. A deafness supervened in the right ear, accompanied by tinnitus, giddiness, and headache. There were no changes apparently in the membrane, middle ear, or Eustachian tube. The acoumeter was not heard with the left ear, nor with this ear could he hear a loud voice. With the right ear the acoumeter was heard at a distance of four centimeters, and loud conversation at one-third of a meter; no sound was heard through the cranial bones. The tuning-fork was heard with the left ear longer when the fork was placed on the mastoid process than when it was held to the ear. It was the reverse with the right ear. The deafness in the left ear

¹ Nos. 4, 5 and 6 *Wicner mediz. Blätter*, 1885.

² In a case of typical Ménière's affection under my care in 1885 the giddiness was relieved and the tinnitus modified by pilocarpine injections; the relief has been permanent.

was doubtless due to stapedial fixation and loss of sound conduction: in the right ear to syphilitic effusion into the labyrinth. Without going into the daily progressive improvement under pilocarpine injections, it will be sufficient to state that after the thirty-second injection the hearing of the right was normal and the subjective noises had disappeared, and the interference with the musical perception was completely removed.¹

We may thus summarise the conclusions of Professor Politzer with regard to the use of pilocarpine injection in affections of the labyrinth.

(a) It is in syphilitic affections of the labyrinth that it is of most service; (b) in those syphilitic cases which may be regarded as hereditary it is of less use; (c) in cases in which there has been middle-ear disease, arising out of diphtheria or scarlatina, pilocarpine is useless; (d) it is useless in old cases following on meningitis or cerebro-spinal fever, though in recent cases (Jacobson) it may be tried with success; (e) there is a large percentage of failures in advanced cases, but the success of the treatment is sufficient to warrant its employment in recent and more desperate cases of so-called

“nervine deafness”; (f) it should be administered early in the deafness and persevered in for some time; it is harmless in its operation given in the doses before recommended.

In true Ménière's disease, if we have to deal with the onset of the affection, the most judicious treatment would appear to be rest in the horizontal position, post-aural vesication and embrocations, the administration of salines and bromide of potassium with ergot. Later on, iodide of potassium may be used, both by mouth and in the form of warm injection into the Eustachian tube. Quinine must be given tentatively and with caution. I have known leeches applied behind the concha afford relief to the loud tinnitus and giddiness. Bromide of potassium combined with hydrobromic acid will occasionally relieve the head symptoms. Digitalis, the salts of zinc, both bromide and sulphate, hydrobromic ether inhalation of nitrite of amyl, nitro-glycerine, the subcutaneous injection of pilocarpine, are all means which may be resorted to with benefit. Galvanism, both external and internal, may be tried. I have not any faith in it for these cases from my personal experience.

CHAPTER XIX.

DEAF-MUTISM.

IMPORTANCE OF EARLY ATTENTION TO CAUSES—PATHOLOGY—TREATMENT—MODE OF TRAINING THE DEAF-MUTE—BELL'S SYSTEM—GENERAL AXIOMS REGARDING.

DEAF-MUTISM.

Importance of Attention to the Subject.—Any physician who has had a child brought to him for his opinion as to the probabilities for or against the little one's hearing or speaking, and who has seen the look of agony and despair on a mother's face as she hears her worst fears confirmed, must feel the great importance of the subject of the education of deaf children. In a professional point of view, it is of vital importance that all who are consulted in such cases, where the hearing is either in great part or entirely lost, and the power of speech absent, should be in a position to advise

parents as to the best course to pursue in the training of the child; and it is also of vast moment, from a social aspect, that deaf-mutes should be so taught as that they may become fairly useful members of society, and be fitted to fill certain positions and earn a livelihood. The few remarks that I make on this subject are intended merely to draw the attention of practitioners generally to the means which can be adopted to remove in some measure the deplorable consequences of this melancholy affliction. As Turnbull of Philadelphia so well expresses it: “(1) to excite a greater degree of interest in physicians

Another most remarkable case of complete deafness is quoted, which was completely cured after daily injections continued for three weeks.

for the deaf-mute, with an endeavour on their part to prevent deafness, and so diminish the number of deaf-mutes; (2) to induce a more conscientious study and treatment by physicians of the ears of their patients when the latter are attacked by scarlet or typhoid fever, cerebro-spinal meningitis, or obstruction of the Eustachian tubes as the result of measles, diphtheria, tonsillitis, or syphilis; (3) to lead physicians to give the systems of instruction pursued in our various institutions for the deaf and dumb a certain amount of study, so as to be able to recommend intelligently to patients, their relatives, or friends, the best method for each individual case; and that there should be appointed a commissioner to collect, examine, and classify the deaf and dumb, so that all who are found to possess any degree of hearing, or any remnant of speech, may be taught articulation by the lip method, and that those who are unable to profit by this system may be taught the language of signs, natural or acquired."

Time to commence Treatment.—There can be no doubt that the earlier this is begun the better. If with the mutism there are some objective signs of aural disease, these should be attended to while the child is instructed and taught to speak. I have known myself a few instances of children who were over four years of age who were gradually taught to speak, while the hearing was improved by local treatment. Hartmann,¹ Semaldz,² Alt,³ and others have reported cases of restoration of speech both in cases of acquired mutism and in those of children who could only utter a few words before some local affection such as scarlatinous inflammation attacked the hearing. Alt's case is a remarkable one, as the boy was seven years old and had lost his speech after scarlatina, for a period of four years. He "became very talkative and attended an ordinary school." Hartmann says that, "as a rule, it may be assumed that deafness occurring up to seven years of age will have dumbness as its consequence, while speech is retained if the child be older than that. Still

there are cases on record in which children of fourteen and even fifteen years of age have lost their speech by becoming deaf. In such cases it must, however, always remain doubtful whether deafness alone was the cause of the deaf-mutism."

Some little time since I had a girl, aged 16, brought to me to hospital who had in a remarkable manner acquired this habit of speaking. I tested her by several sentences and by carrying on conversation with the friends who brought her, and no matter how quickly I spoke, she understood everything I said. She had lost her hearing when a child from scarlatina, and had subsequently lost her power of speech.

Several other patients at various ages I have had with me who, with a little rude care and teaching on the part of parents, could quite carry on conversation though absolutely deaf.

"We will assume," says Trötsch, "that among the 38,489 deaf-mutes in Germany, only 15,000 were not born with the defect, but acquired it subsequently, and we will surely not be far out if we assert that a fifth of those, viz., 3000, if they had received timely and energetic treatment, would not have become deaf-mute, but at the worst hard of hearing to a high degree, so that they might have made use of ordinary private tuition, or could even have attended the public schools, and would at anyrate have retained intelligible speech."

CAUSES OF DEAF-MUTISM.

As the principal causes of deaf-mutism, we have consanguineous marriages, heredity, naso-pharyngeal troubles, throat and nose affection, catarrh of the middle ear, suppurative otitis media from scarlatina, exanthemata, cerebral affections (convulsions), injuries. Typhus is regarded by Hartmann as a potent cause. In the Fever Hospital in Cork (where I treated over six hundred cases of severe typhus fever in patients of all ages) I have never known a case of deaf-mutism arise from this disease while I was attached to the hospital, a period of over eleven years.

Deafness during the fever, and permanent partial deafness of one or two ears, was the worst result I have seen. I can only call to recollection a few cases of complete deafness after typhus fever,

¹ Hartmann on *Deaf Mutism*, translation by J. P. Cassels, M.D. (Baillière, Tindall & Co.).

² *Archiv für Augen-und Ohrenheilk.*, vol. vii. 211.

³ *Über die Taubst.*, p. 105a.

but their speech was not affected. Elsewhere I have dwelt on the importance of treating naso-pharyngeal troubles in children; this is evident, so far as their effect in causing deafness and resulting loss of speech, from the following statement by Hartmann (*op. cit.*):—"It has been ascertained by *post-mortem* examinations that inflammations of the middle ear are frequently accompanied by inflammation of the labyrinth. While Moos particularly has shown that the membranous labyrinth is infiltrated with small cells, even in cases of slight inflammation, a number of other observers have proved the existence of an accumulation of pus in the labyrinth in cases of severe inflammation of the middle ear.

"In cases of chronic inflammation of the labyrinth, developed in primary diseases of the ear, or occurring as a consequence of general diseases, hyperaemic swelling, fatty or connective-tissue degeneration, atrophy of the membranous labyrinth, changes in the labyrinthian fluid, and deposits in the same take place. It has already been pointed out, when speaking of congenital deafness, that naso-pharyngeal catarrhs may be the cause of deafness, and that catarrhs, occurring unnoticed in early childhood, may lead to a deafness which is then mistaken for congenital deafness."

As those congenital and acquired conditions of the naso-pharynx and ear, so frequently associated with adenoid growths in the latter situation, are specially prone to produce otitis media, the importance of attention to these tumours in children is manifest.

Pathology.—From Hartmann's table of the results of *post-mortem* examination of deaf mutes, I select a few examples of the changes found in congenital and acquired deafness in the middle and internal ear:—

(Bochdalek, *vide* Lincke, p. 594).—Congenital malformation. On both sides the three semicircular canals ending as culs-de-sac, without opening into the vestibule, and the auditory nerves much atrophied. In addition, changes in the tympanic cavity, which had probably taken place after birth.

(Moos, *ibid.*, vol. vii. p. 448).—Congenital middle ear. Ankylosis of the siccula with each other; osseous closure of both *fenestrae rotundae*; great abund-

ance of otoliths and numerous colloid globules in the labyrinth.

(Cock, *vide* Toynbee's list).—Not stated if congenital. All the ossicula absent; membranæ tympanorum partially destroyed; in addition, two of the semicircular causes imperfect.

(Schwartz, *Archiv für Ohrenheilkunde*, vol. v. p. 296).—Acquired. Complete absence of the labyrinth; in the left ear a solid osseous mass in its place, in the right ear a mass of fibrous tissue. Tough mucus in both tympanic cavities. It was stated that deafness had set in in consequence of an inflammation of the brain.

(Politzer, communicated to the second Otological Congress, held at Milan in 1880).—Acquired. The cavity of the cochlea and the semicircular canals completely filled with a newly formed osseous mass.

THE MANAGEMENT OF THE DEAF-MUTE.

We may divide the training of the deaf-mute under two heads:—(1) moral; (2) scholastic.

If the child lives at a distance from a training school, he should be sent to one where he will be treated by teachers of established reputation with kindness and forbearance. This moral training of deaf-mutes is of special importance. While considerable kindness is shown them, they must be made to know the difference between right and wrong; their habits of order and discipline should be carefully attended to. Foolish indulgence is as bad as excess of severity. The general deportment and carriage of the child should be attended to, to prevent the awkwardness in gait and manner so often accompanying deaf-mutism. So should the special senses of sight and touch be cultivated. Companionship is indispensable; it enlivens the spirits, prevents moroseness, helps the cultivation of ideas, brings the child into constant contact with those who hear. Any words uttered before a child has become deaf must be preserved, and the faculty of speech preserved in every possible manner. I believe that, for a time at least, every deaf-mute is better away from home influences, and under the care of skilled teachers. It may be said that in no occupation in life is greater exercise of patience, of gentleness combined with firmness, the happy combination of a

pleasant and hopeful manner without any relaxation of discipline, more demanded, than in the teacher of the deaf-mute.

Scholastic Training.—As it happens that a large proportion of mutes do hear sounds, the voice, certain notes, &c., it is evident that an endeavour should be made at all times in children to increase this power. Much may be done at home in this way to train the child.

In every instance, especially when the child is sufficiently intelligent, the parents and friends should be cautioned to persevere in coaxing the child to articulate and copy sounds. The hereditary and congenital aspects of mutism are not to be forgotten, and the intermarrying of near relatives of deaf or mute persons should be discountenanced. But decidedly in all cases where such a step can be taken, the child should be early removed to an institution where the teachers are accustomed to take real trouble, and to give the mute the benefit of a skilled training. As Dr Turnbull remarks on this matter: "Congenital deaf-mutes, attending an ordinary school, may learn to write, or rather to copy, and may perhaps get some idea of numbers; but the teachers of such schools do not know how to teach their pupils' minds, even if they have the time to teach them. As a rule, such children might as well be at play, except that school occupies their time and their thoughts. Another advantage, however, which is gained for the deaf-mute children is in their mingling as much as possible with those who hear.

If a child cannot profit by the instruction given in an ordinary school, let him if possible have a private teacher, but not necessarily in his own house, as he is not always subject to the best government there. If he needs stimulating, it may be well to place him in a class with four or five others of a suitable degree of advancement; and if this cannot be done, he may be placed in a school or institution where the instruction is especially adapted to the deaf.

If children are too deaf to profit by the common school, and yet have sufficient hearing to have acquired speech through the ear, instructors of the deaf are nearly or quite unanimous in the opinion that they should be taught by articulation and lip-reading. The ex-

perience of the teachers would lead them to say, "Let the attempt be made, if possible, to teach *every* deaf child in this way."

There can be no doubt that the lip method is the one to adopt in the education of the deaf-mute. In France as much progress has not been made as in Germany, where the results achieved have been wonderful. Taught thus, and if well instructed, he is, as Dr Hartmann says, "not at all inferior to his perfect fellow-men; he is able to understand all kinds of writing, and to instruct himself by reading them, he can learn foreign languages, and choose any calling he likes." In the United States, Turnbull tells us (1880), "it has been received and adopted in seven of our forty-eight institutions, and with the most gratifying results. The United States have a 'National College' at Washington, where more advanced studies can be pursued, and where young deaf-mutes are graduated with a standing and scholarship not inferior to that achieved by the graduates of ordinary colleges. This institution bears to others for the deaf and dumb the same relation that colleges bear to schools and academies. Many of the graduates of this college have received appointments as teachers, while others are editors, authors, and writers, or are found in the various government offices, in the exercise of duties which they are quite capable of performing in an entirely satisfactory manner. In the Centennial Exhibition were some admirable pictures executed by deaf-mutes, as well as other products of their pencils and pens. They are also capable handiworksmen, and are to be found in our shops and factories, as well as in the Industrial Homes founded for their special benefit."

In this country the school for the training of the deaf-mute, under M. von Praagh, has achieved a wide and deserved notoriety, and I speak from personal observation of the results of the admirable system of training in this establishment at Fitzroy Square.¹

I add, for the information of those

¹ There is a school for the education of mute children of the upper classes under the management of Mr Harry White (from whom full information may be had), at 115 Holland Road, Kensington.

who are not acquainted with the method of teaching by the lip, a few illustrations from the method of Bell, which may serve as a guide to the manner in which, even before a child can be removed to a training school, he should be taught.

I avail myself of Turnbull's description of Bell's articulate method:—The foundation of the system rests upon the fact that articulation is simply a *mechanical* process, the result of certain well-defined positions and movements of the vocal organs, together with a more or less forcible expulsion of air from the lungs. Of the former, the sense of vision renders the deaf-mute cognisant; of the latter, his sense of feeling. All mute children are irritative—the mute child is particularly so—and it is upon the possession of this faculty, *imitation*, that our success in teaching depends. We proceed, then, at the onset by making simple gestures with the arms, the easier gymnastics, in short; then we walk, look in various directions, sit, stand, &c.

“ Having thus engaged the attention, place the child directly in front of you, press your upper teeth in a marked manner upon the lower lip, hold a bit of paper in your hand and blow. He sees the paper fly away, is amused, imitates the process, and has given his first letter, *f*. Again, swell your lips out with air, open them quickly, the paper flutters away; this is *p*. Should it be too forcible or not sufficiently so in forming this letter, then imitate a person smoking a pipe; the *puff, puff* conveys the idea of *p*.

“ *T*. Place the tongue between the teeth, force the air out so that it will come in one volume, which is best felt on the back of the pupil's hand, and *t* is produced.

“ *H* is simply the expiration of breath with slightly increased force, the mouth opened naturally.

“ *M*. With closed lips the force of the letter *m* is felt by the pupil, who must apply his finger to the side of his nose; the vibration indicates the rapid expulsion of air from the lungs.

“ *N*. In the same manner the mute learns the nasal *n*, but is shown the mouth opened slightly, and the tongue pressing against the back of the upper teeth. The six consonants are the ones perhaps most easily learned.

“ *B* is formed like *p*, but is accompanied with sound; the throat is both seen and felt to dilate, and the expulsion of breath is also less forcible, the puff is gentler.

“ *D* resembles *t*, although it is better in the beginning to teach the pupil to place the point of the tongue back of the upper teeth; the vocalisation is made apparent as in the case of *b*, also the less decided emission of breath.

“ *V* is simply a vocalised *f*, and, as in the case of *z* and the sub-vocal *th*, the vibration is most sensibly perceived by pressing the palm of the pupil's hand upon the crown of your head.

“ *O*. The vowel *o* is attended with no difficulty. Place the child's hand firmly on your breast that he may feel the vibration, while he sees your mouth assume the shape of the letter produced.

“ *E*. Place the pupil's fist under the angle of the jaw; the peculiar and forcible vibration there felt he readily produces.

“ *A*. Press the palm of the pupil's hand against the chest, and show him your tongue firmly set against the lower teeth, and somewhat arched; with this position the letter *a* as in *fate* is produced.

“ *I*. To form *i* open the mouth very wide, and, as you produce sound, close it quickly.

“ *U* is made like *o*, except that the lips are nearly closed.

“ As soon as the pupil has learned the sounds of the vowels, require him to join a consonant with each in succession, making easy syllables, as *fa, fe, fi, fo, fu*, and reversing the letters, *af, ef, &c.* Next teach him simple words, the names of objects which he can see, or pictures of them which can be shown him, as map, mat, cap, cat, dog, horse, cow, top, &c. The next step is to embody these in the form of a sentence, as ‘What is that?’ ‘That is a cat.’ ‘What are those?’ ‘Those are maps.’ The point cannot be too strongly insisted upon that the child should write, as well as speak, everything he learns. This constant practice strengthens the memory and insures steady and permanent progress.”

Professor Bell recommends “articulating rapidly combinations containing *and, but, the*, with *a, an, at, &c.* He had found that senseless exercises also gave great pleasure to deaf children when

the syllables were arranged rhythmically."

"He would therefore recommend teachers of very young deaf children to study such a book as 'Mother Goose,' and to set their articulation exercises to the rhythm of the most favourite rhymes."

I would conclude these observations on deaf-mutism by laying down these axioms for the practitioner's guidance.

1. In all cases of deaf-mutism exhaust every means of ascertaining the smallest retention of hearing in both ears—try

this by various noises, musical tones, the tuning-fork, &c.

2. Critically examine the ear and throat for local causes of deafness, and under any circumstances heal these if present.

3. Begin as early as possible the training of the child, and guide the parents by judicious advice, both as to the moral and mental management.

4. Urge the child being sent to a skilled teacher to learn, or reputed training school.

To detect Malingering in cases of Feigned Deafness.

1. Examine carefully the ear and nasopharynx for objective evidences of any aural affection.
2. *In Unilateral Deafness.*—The eyes being blindfolded, test with the watch and acoumeter the hearing distance of both ears repeatedly, the person's head being turned in different directions.
3. Place a tuning-fork (Chimani) on the middle of the vertex of the head; ask the person which ear he hears loudest in—the malingerer will, as a rule, affirm that he hears the sound loudest in the healthy ear, or that he can detect little difference, or that he does not hear it at all in the deaf ear; close now the healthy ear, and the malingerer will assert that he does not hear the sound, or only indistinctly.
4. Take a binaural stethoscope (David Coggin), plug one of the soft tubes, so as that the sound passes off (as a low voice) through this tube is prevented; place now both the ear-pieces in the person's ears, taking

care that the plugged tube communicates with the hearing ear; speak to the person through the cup-end of the stethoscope—the malingerer will say he hears; next remove the tube from the hearing ear, and again speak through the stethoscope—the malingerer now says that he does not hear, as the tube has been removed from the sound ear.

5. In Bilateral Deafness—

- (1) Inquire carefully into the history of the case, mode of onset, and duration of deafness.
- (2) Examine both ears carefully, and apply in different methods the various hearing tests.
- (3) Find if a loud noise or call will awake the person from sleep (Politzer).
- (4) Propose certain operative procedures in the deaf person's presence—such as electricity, puncturing the drum with the cautery; speak of the painful nature of these steps, watch the expression of the countenance.
- (5) Try in every way to take the suspected person unawares.

A P P E N D I X.

A FEW THERAPEUTICAL FORM- ULÆ OF USE IN AURAL AFFECTIONS.

EXTERNAL EAR.

To assist in the removal of Cerumen

Add bicarbonate of soda (grs. xx. ad. 3*i.*), with glycerine (3*i.* ad. 3*i.*), to the warm water used in syringing.

Instil into the meatus for a few nights some drops of glycerine 10 parts, and liq. potassæ 1 part.

To apply to a dry meatus, with absence of cerumen.

White vaseline, lanolin, benzoated lard, glycerine, equal parts ; 1 part in 10 of the red oxide of mercury or white precipitate ointment, may be added to this.

In Eczema of Auricle.

(Lanolated) ointment of oxide of zinc—lanolin 2 parts, benzoated lard 1 part, almond oil 1 part, oxide of zinc, 1 part to 7.

Lanolated ointment of diacetate of lead ; lanolated ointment of oleate of lead ; lanolated ointment of oleate of zinc.

Ointment of nitrate of mercury 1 part, ointment of red oxide of mercury 1 part, ointment of spermaceti 5 parts, almond oil 1 part.

Ointment of calmoogra oil—2 parts of calmoogra oil added to 6 parts of the lanolated zinc ointment.

Carbolised ointment—1 part of carbolic oil (2*i.*) added to 7 of the lanolated ointment of zinc, or to the calmoogra ointment.

Ointment of iodoform or iodol—iodoform 1 part, fresh coffee 1 part (vaniline 5 grs., or coumarine 5 grs. may be added to deodorise), glycerine 2 parts, almond oil 2 parts, white vaseline 10 parts ; iodol may be substituted for the iodoform, and the deodorants omitted.

LOTIONS.

Lime water with diacetate of lead—3*i.* liq. plumbi diacetatis in 5*viii.*

CALAMINE LOTION (Wilson).

Oxide of zinc 3*i.*, calamine (finest) 3*iv.*, glycerine 3*i.*, rose water 3*viii.*

Some of this is used to pat the raw or moist surface with in the daytime, lightly sponged off at night, and the lanolated or simple zinc or other ointment applied.

OTHER LOTIONS.

Lotion of sulpho-carbolate of zinc.

Lotion of liq. carbonis detergens (3*ss.*—3*i.* ad. 3*x.*)

Lotion of acetate of lead.

Lotion of carbolic acid.

Lotion of boracic acid.

Lotion of calomel.

APPLICATIONS.

Nitrate of silver. After removal of the scab to be lightly applied to the raw surface, previously dried.

Nitrate of silver solution, various strengths, to be applied with a brush.

Chromic acid solution (grs. x.—xx. ad. 3*i.*)

Carbolic acid with glycerine.

Chloride of zinc solution

(grs. xx.—xxx. ad. 3*i.*)

Iodoform or iodol, either in powder or in solution with ether.

Iodide of starch 1 part, oxychloride of bismuth 1 part, powdered starch 6 parts. To dust a foul surface.

Both of these latter remedies are indicated in syphilitic cases.

In chronic eczematous conditions of the External Meatus.

Boracic acid, saturated solution of, 2

parts, absolute alcohol 1 part, glycerine 1 part.

To be applied with the aural probe or cotton holder, or with a stiff camel's hair brush after cleansing and drying the meatus.

Salicylic acid may be used in the same manner.

Carbolie acid 1 part, alcohol 1 part, glycerine 4 to 10 parts.

Chromic acid solution (grs. x.-xx. ad. 3*i*), iodoform or iodol in solution (3*i*. ad. 3*i*).

The stimulant or astringent ointments mentioned above may be applied to the meatus with a brush.

In purulent discharges from the Ear.

WASHES OF

Sulpho-carbolate of zinc, boracic acid with baborate of soda, salicylic acid, sulphate of zinc, chloride of zinc, carbolic acid, permanganate of potash, various strengths.

These are best ordered in the concentrated form to be added to a given quantity of *recently boiled water*, and used thus diluted, for example:—Boracic acid 3*ii.*, baborate of soda 3*iv.*, absolute alcohol 3*i.*, glycerine 3*i.*, distilled water 3*ii.* 3*ii.*—3*iv.* to be added to the 3*iv.* of water and used to wash the ear out with.

Sulpho-carbolate of zinc 3*ii.*, chloride of zinc 3*ii.*, carbolic acid 3*i.*, absolute alcohol 3*ii.*, distilled water 3*ii.*

To be used in the same manner as the last.

To relieve pain in the Ear in otitis externa or myringitis and neuralgia.

Cocaine solution, 10° instilled.

Hydrobromic ether with glycerine, instilled.

Chloroform 2 parts, liniment of aconite 1 part, applied to mastoid.

Laudanum 1 part, liniment of belladonna 1 part, applied to mastoid or meatus.

Fomentation of decoction of poppy-heads and chamomile flowers.

The same of laudanum water.

To apply behind the Ear.

Post-aural vesication or counter irritation.

Leiter's temperature tube.

Ointment of veratrin.

Hypodermic injection of morphia.

In Aspergillus.

After disinfectant cleansing of meatus; applications of boracic acid in solution with absolute alcohol.

Absolute alcohol and glycerine.

Solution of hypochlorite of lime (grs. ii. ad. 3*i*.).

Chinoline salicylate 1 part, and boracic acid 15 parts, insufflated (Burnett).

(See Treatment of Aspergillus, p. 101.

Exostosis in the Meatus.

Application with aural probe of chromic acid (grs. xxx. ad. 3*i*.).

Nitrate of silver (grs. xx. ad. 3*i*.).

Chloride of zinc (grs. xxx. ad. 3*i*.).

AFFECTIONS OF THE TYMPANUM.

Acute perforation of the Membrana Tympani.

Warm anodyne and weak antiseptic lotions:—

Laudanum and decoction of poppy-heads.

Bicarbonate of soda (grs. v. ad. 3*i*.).

Chloride of ammonia (grs. v. ad. 3*i*.).

Boracic acid (grs. iv. ad. 3*i*.).

Carbolic acid (gr. i. ad. 3*i*.).

Bichloride of mercury, 1 in 5000.

Permanganate of potash (gr. i. ad. 3*i*.).

Sulpho-carbolate of zinc (gr. ii. ad. 3*i*.).

Salicylic acid, grs. iii. ad 3*i*.

Chronic suppurative conditions of Membrana Tympani and Cavity.

POWDERS FOR INSUFFLATION (see page 71), (gr. i.—grs. ii. of).

Boracic acid.

Salicylic acid, 1 part; boracic acid, 3 parts.

Resorcin, 1 part; with boracic acid, 8 parts.

Iodol.

Iodoform.

WASHES (see above).

To wash out tympanum (see pp. 44, 66, 133).

Applications to granulations made with fine pencil of cotton-wool or aural probe (see page 45):—

Chromic acid, 1 part; water, 12 parts.

Chloro-acetic acid.

Carbolic acid.

Nitrate of silver (grs. xxx. ad. 3*i*.).

Absolute alcohol, 1 part; carbolic acid, 1 part; glycerine, 1 part.

Intra-tympanic medication in catarrhal conditions.

VAPOURS.

Iodine, chloride of ammonia, iodoform
(*see* Cigarettes, also pp. 60, 61, 160, 169).

SOLUTIONS USED WITH CATHETER.

Bicarbonate of soda (grs. v.—grs. x. ad. $\frac{3}{2}$ l.).

Chloride of ammonia (grs. ii.—grs. v. ad. $\frac{3}{2}$ l.).

Iodide of potassium (grs. ii.—grs. iv. ad. $\frac{3}{2}$ l.).

Chloride of sodium (grs. v. ad. $\frac{3}{2}$ l.).

EMBROCATIONS AND COUNTER-IRRITANTS.

Chloroform, 2 parts; spirit of horseradish, 1 part; tincture of capsicum, 1 part; tincture of aconite, 1 part. (Useful in tinnitus.)

Oil of mustard, 1 part; spirit of horseradish, 1 part; liniment of chloroform, 2 parts.

Liniment of belladonna, 1 part; liniment of aconite, 1 part; chloroform, 1 part; liniment of camphor, 2 parts.

Iodine, 1 part; mastic, 1 part; rectified spirit, 8 parts. An iodine pigment, to apply to the mastoid process; it may be mixed with equal parts of flexible collodion.

Liquor Epispasticus (Smith's). To apply to the mastoid with a brush.

Charta Epispastica.—A small portion cut to shape and applied to the mastoid.

INTERNAL EAR.

TINNITUS AURIUM.

*Internal Remedies.*¹

Hydrobromic acid—dil.

Cafeine.

Bromides of potassium and ammonium.

Eromide of zinc.

Bromide of caffeine.

Bromide of iron.

Phosphide of zinc.

Quinine.

Strychnine.

Arsenic.

Digitalis.

Convallaria.

Hydrobromate of cocaine.

Hydrobromic ether, min. v.; powder of acacia, gr. xx.; glycerine, min. xx. in $\frac{3}{2}$ ss. of water (Turnbull).

¹ For indications *see* chapters on Tinnitus Aurium.

Nitrite of amy1 (in capsule).

Nitro-glycerine (in tablet).

Ergotin.

Sclerotic acid.

Muriate of Pilocarpine, 2 drops of a 2 per cent. solution injected subcutaneously and repeated at intervals.

VARIOUS CHOLAGOGUES,

as

Iridin.

Euonymum.

Hydrarg. cum creta.

Podophyllin.

Taraxicum.

APERIENT WATERS,

as

Hunyadi-Janos.

Victoria (aperient.).

Esculap.

Friedrichshall.

Pullna.

Carlsbad.

VEGETABLE APERIENT.

Extract of cascara sagrada (liq.) $\frac{3}{2}$ l., glycerine $\frac{3}{2}$ l., water $\frac{3}{2}$ viii.— $\frac{3}{2}$ ss. as a dose early in the morning, and a warm drink after.

In syphilitic cases.

Mercurial (lanolin) inunction.

Bicyanide or bichloride of mercury (gr. $\frac{1}{2}$).

Aix-la-Chapelle, course at.

Pilocarpine injections.

Electricity.

Iodide of potassium or the mixture of the three iodides—potassium, sodium, ammonium.

In anaemic cases.

Salts of iron.

Pyrophosphate of iron (syrup of).

Fellows' and Easton's syrups.

Arsenious acid, gr. $\frac{1}{40}$

Quinine, gr. i

Sulphate of iron (dry), gr. i.

Extract of nux vomica, gr. $\frac{1}{4}$.

Extract of gentian, grs. ii. Fiat Fil.

One pill after food three times in the day.

Other iron preparations according to indication.

St Raphael wine.

Fer Bravais.

Spa and other ferruginous waters.

For the indications for these various remedies in the different forms of tinnitus, and the other general hygienic treatment, *see* chapters on Tinnitus Aurium and Treatment of Tinnitus, pp. 145–160.

NASO-PHARYNX.

NASAL AND POST-NASAL INSUFFLATIONS
(alone or combined).

Oxychloride of bismuth, gr. ss. gr.-i.
(maize) starch, grs. ii. to grs. iii.
Iodol, gr. ss. (maize) starch, grs. ii. to
grs. iii.
Iodoform, gr. ss. (maize) starch, grs. ii.
Tannic acid, gr. ss. to gr. i. (maize)
starch, grs. ii.
Alum (dry), gr. ss. to gr. i. (maize)
starch, grs. ii. to grs. iii.
Ferrier's snuff (see page 108).

Insufflations may be ordered in bulk, and
the proper quantity used at each in-
sufflation).

COLD NASAL SPRAYS, for use with
Atomizer.

Solutions.

Bicarbonate of soda (grs. x.-xx. ad. ʒi.).
Biborate of soda (grs. x. ad. ʒi.).
Chloride of sodium (grs. xx.-xxx. ad. ʒi.).
Chloride of ammonia (grs. x ad. ʒi.).
Chloride of zinc (grs. ii.-v. ad. ʒi.).

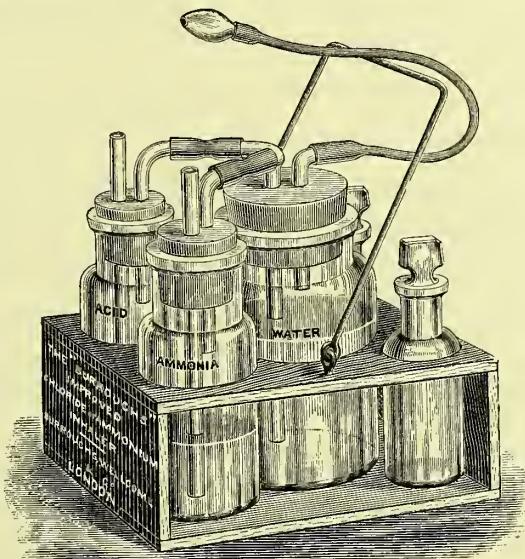


FIG. 128.—Continuous Chloride of Ammonia Inhaler. This figure shows the inhaler referred to at page 60. It is always ready for use, and does not require recharging with the ammonia and acid on each occasion that it is used.

Dobell's snuff—camphor, tannic acid, white sugar, high-dried Welsh snuff, equal parts.

Bismuth (gr. ii.) and morphia, (gr. $\frac{1}{2}$); starch, (grs. iii.).

PHARYNGEAL INSUFFLATIONS.

Iodol, gr. $\frac{1}{4}$ to gr. ss.	Diluted with Starch or Lycopodium or both.
Iodoform, gr. $\frac{1}{4}$ to gr. ss.	
Tannic acid, gr. ss.	
Oxychloride of bismuth, gr. ss.	
Trismiritate of bismuth, gr. ss.	
Catechu, gr. ss.	
Kino, gr. ss.	
Alum, gr. ss.	
(Diluted as directed, all these in-	

Chlorinated soda, liq. sod. chlor. ʒi. in ʒiv.

Carbolic acid (grs. iii. ad. ʒi.).

Alum (grs. ii.-v. ad. ʒi.).

Tannic acid (grs. iii.-v. ad. ʒi.).

Ferro-alumini (grs. i. to ii. ad. ʒi.).

Sulphocarbolate of zinc (grs. ii ad. ʒi.).

Boracic acid (grs. v. ad. ʒi.).

Salicylic acid (grs. ii. ad. ʒi.).

Sulphurous acid, 2 per cent.

Cocaine, 4 to 10 per cent.

Permanganate of potash (grs. ii.-v. ad. ʒi.).

Iodoform in ether (grs. xx. ad. ʒi.).

Thymol, 1 in 2000.

Some of these can be used in combination, glycerine being added to the water,

and may be applied to the pharynx and posterior nares.

NASAL DOUCHES (see pages 70-75).

STRONGER TOPICAL REMEDIES FOR THE NARES AND NASO-PHARYNX.

Chromic acid (grs. x.-xx. ad. $\frac{3}{i}$).

Tannic acid (grs. x.-xx. ad. $\frac{3}{i}$), with glycerine.

Nitrate of silver (grs. x.-xxx. ad. $\frac{3}{i}$).

Chloride of zinc (grs. xx.-xl. ad. $\frac{3}{i}$), with glycerine.

Iodoform, in ether (grs. xx.-xxx. ad. $\frac{3}{i}$).

Sulphate of copper (grs. xxx.-ad. $\frac{3}{i}$).

Compound tincture of benzoin and glycerine, equal parts.

Carbolic acid with glycerine, various strengths.

Perchloride of iron (grs. xxx.- $\frac{3}{i}$ ad. $\frac{3}{i}$).

Boracic acid, saturated solution.

Aldehyde and glycerine, equal parts.

NASAL BOUGIES (see page 75) may be had, made with gelato-glycerine.

Tannic acid.

Iodol.

Iodoform.

Nitrate of silver.

Sulphate of zinc.

Acetate of lead.

Carbolic acid.

Boracic acid.

Bismuth.

CIGARETTES (see page 75).

Iodoform.

Iodol.

Eucalyptus.

Cubeb.

LOZENGES.

The most useful are:—

Compound Eucalyptus.

Chlorate of potash.

Kino.

Guaiacum.

Benzoic acid.

Bismuth.

These should be ordered "according to the formula of the Throat Hospital Pharmacopœia."

Compressed Tablets (Burroughs & Wellcome) of the above can be substituted.

PASTILES.

Each of the above agents may be had of any chemist in the form of soft jujube or pastile (made with glyco-gelatine); they are softer than the lozenges, and are at times to be preferred.

Pastiles of cocaine are useful in some cases of painful throat affection.

GARGLES FOR THE PHARYNX AND NASO-PHARYNX (see pages 72-75).

TO USE WITH STEAM ATOMISERS (in water at 140° - 150° temperature).

Thymol, 1 in 2000.

Terpinol (min. xv. ad $\frac{3}{x}$).

Eucalyptol (min. xv. ad $\frac{3}{x}$).

Ol. pin. sylvestris (min. xv.-xx. ad $\frac{3}{x}$).

Tincture of iodine (min. xx. ad $\frac{3}{x}$).

Compound tincture of Benzoin (min. xxx. ad $\frac{3}{x}$).

Camphorated spirit (min. xxx. ad $\frac{3}{x}$).

Aqua camph. concen. (Corbyn) mixes well with water, and may be used as a basis for other inhalants ($\frac{3}{ii}$. ad $\frac{3}{x}$).

Carbolic acid min. (xv. to xx. ad $\frac{3}{x}$).

Creosote (min. x. ad. $\frac{3}{x}$).

Light carbonate of magnesia may be added to suspend the oils in water thus:—

R. Ol. eucalypti;

Ol. pin. syl (vel terpinol) $\frac{aa}{3}$ $\frac{3}{i}$;

Magnes. carb. lev., $\frac{3}{i}$;

Aq. camph. concen., $\frac{3}{i}$;

Aquam, ad $\frac{3}{iv}$.

3ss. added to the half pint of water at 150° for steam atomising or inhalation in Spencer Thompson's naso-oral jug inhaler.

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